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Annual Report

of the

Department of Agriculture in the Bombay Presidency

For the Year 1927-28

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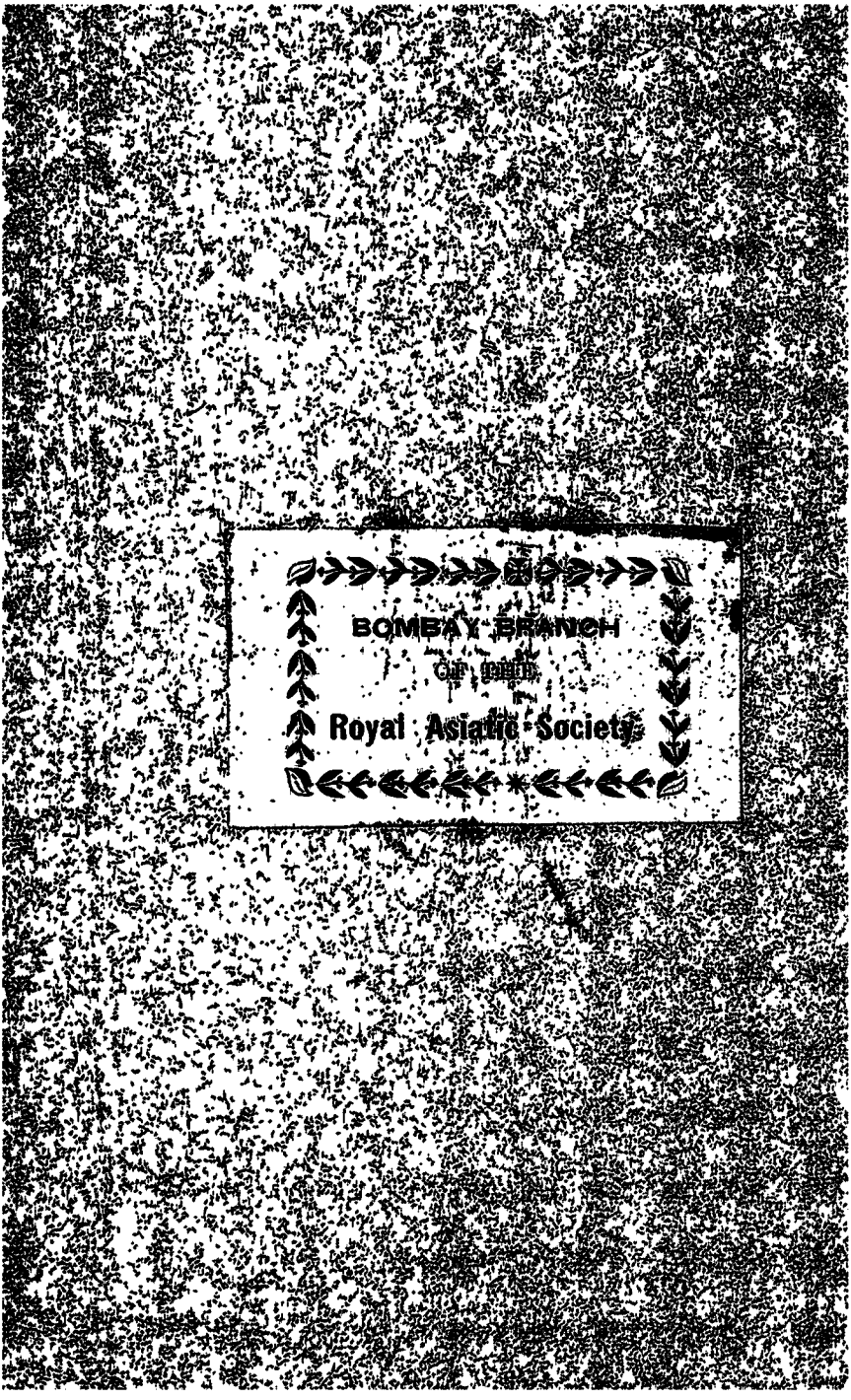

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1927-28

The general agricultural awakening in the Bombay Presidency, to which reference has been made in the past, continues to expand. This can be observed in many forms, such as the desire of the cultivator to adopt land improvement schemes, the attention given to the economics of sugarcane, the demand for premium bulls, the interest taken in horticulture, the anxiety to secure seed of improved varieties of crops and the efforts to develop local organisations for promoting agricultural improvements. This public interest in agriculture has received a strong stimulus from the work of the Royal Commission on Indian Agriculture. It is also pleasing to note that the first Presidency Agricultural Show has, to an appreciable extent, kindled the imagination of some of the rural leaders who see fresh opportunities for useful service to their districts.

Generally it may be said that the average public man, has, to-day, a fuller realization of the importance of Agriculture to India than he had a few years ago.

Agricultural Conditions of the Year.

The year 1927-28 was, on the whole a favourable one. The outstanding phenomenon was the deluge in North Gujarat, Kathiawar and South Sind. This happened at the end of July and the marginally noted figures give some indication of its magnitude. The rain was practically continuous for six days, and the whole of North Gujarat was converted into a vast lake. People took refuge on railway platforms and in upper stories, while livestock sought the higher grounds. The general expectation that the human death-roll would be great, the livestock casualties colossal and the consequent anticipated epidemic of disease devastating, was falsified. There were very few deaths among the people, while the losses in livestock were comparatively small. An epidemic did not break out, due it is said, to

Name of place	Rainfall in inches (25th—30th July inclusively)
Ahmedabad ..	49
Godhra ..	35
Dakor ..	65
Kaira ..	41
Mirpurkhas ..	21

the very prompt action of the Public Health Department. There was, however, great privation for some days, but the chief material damage was to the houses. These collapsed everywhere and on a large scale. Damage to agricultural land was remarkably little; this took the form of scouring in some places and sand deposits in others. All standing crops were destroyed, but, thanks to the relief measures, resowing of kharif crops or the substitution of rabi crops, was general, and visitors to North Gujarat in the subsequent cold weather, found it difficult to realise the severity of the flood.

Prices of agricultural produce showed a downward tendency which was marked in some cases, especially in that of gul (raw sugar). Wages, on the other hand, remained generally at their former levels, so that the labourer was well off while the khatedar suffered.

Services to the Public.

The Department of Agriculture is in a position to render substantial assistance to the agricultural public in a number of directions, and this help is limited, only by the comparatively small size of its organisation. Below I will enumerate the principal forms of assistance that can be given.

Seed.—As a result of the Botanical Research carried out upon the principal crops of the Presidency, the Department has been successful in finding or evolving a number of superior varieties and strains of Rice, Wheat, Jowar, Bajri, Cotton, Groundnuts, Sugarcane, Tobacco and other crops. Before the public can benefit from such work it is necessary to devise machinery for the multiplication and distribution of this seed. In this connection special attention has been given to the organization of the supply of improved cotton and rice seeds. As regards cotton it has been found that the Department with the aid of its own and private seed farms, can develop and control a new variety up to the stage when it occupies from 5,000 to 10,000 acres of land. Beyond this area it has been found essential to pass the work on to some other organisation. Thus in the Karnatak an improved variety of cotton (Dharwar I) has been spread and controlled up to 3,00,000 acres through the Hubli Co-operative Cotton Sale Society. Every thing however ultimately depends upon financing the cultivator while his crop is still growing, and it is in this respect that Co-operative Agency is apt to break down. This has been the

experience of the Hubli Society, which was compelled to contract its activities in the year under report to 1,44,120 acres. Similarly the area sown with our improved variety of Dharwar-American cotton (known as Gadag I) under Co-operative control, has been 49,500 acres in the year under report. In South Gujarat, Co-operative agency has not developed to the same extent, but a special organisation has succeeded in controlling about 11,856 acres, sown with Hybrid 1027 A. L. F. in the year under report while the uncontrolled area reached 4,28,514 acres. In Khandesh more reliance for this work has been placed in the Taluka Development Associations, and the area, sown with the improved variety, known as N. R. cotton, in the year under report is estimated at 14,785 acres, whilst a beginning has been made with the distribution of a superior spinning variety, *viz.*, "Dhulia I" with an area of 4,000 acres. In the Deccan Canals tract the Department has been popularizing cotton cultivation and in the year under report about 14,000 acres has been sown with N. R. cotton in the S. C. D. mainly on the Canals. In Sind the area sown with the improved Deshi variety of cotton known as 27 W. N. was 50,149 acres and that sown with the Punjab-American strain, known as 4F, was 23,908 acres. Turning to rice, the system adopted in the North Konkan is to distribute departmentally controlled seed to a different group of villages each year, and allow natural spread to take place. In the year under report 1,25,000 lbs. of the improved Kolumba Rice No. 42 was so distributed, which was sufficient to sow 3,500 acres. The superiority in point of yield of this strain over the common types grown, is 20 per cent. It is estimated that there were 40,060 acres under this strain in the year under report. The other improved strain is known as Kolumba No. 79; this strain has been found suitable for high-lying areas in Thana District, where in the year under report 11,700 lbs. of seed was distributed. Many other improved strains are in process of evolution at Karjat, and steps are being taken to provide "fine" varieties for certain Talukas (*e.g.*, Wada, Mahim and talukas in North Thana) which are suitable for growing superior rices.

At Larkana the Department has been successful in producing several improved strains of Kangani and Sugdasi rices. These improved strains give an increased yield of about 20 per cent. over the local varieties. Distribution in the villages has been organised, and the areas under improved strains in the year under report were 3,000 acres. Similar work is in progress on a smaller scale with the other cereals, particularly with wheat in Sind.

Groundnuts constitute our most important kharif oil-seed, and remarkable progress has been made with the introduction of early varieties like Spanish peanut which mature on the rainfall and do not require irrigation. The following statement compares the area under groundnuts, twenty years ago with that of each of the last five years in the following localities :—

Locality	Area in acres under groundnuts in					
	1907-08	1923-24	1924-25	1925-26	1926-27	1927-28
Khandesh	5,337	125,102	140,185	297,211	234,267	278,371
Panch Mahals	1	18,014	29,096	44,544	53,191	59,079
Satara	61,683	111,056	103,089	122,651	133,504	154,810
Dharwar	34	8,628	11,510	22,554	36,187	62,297

This is very largely an export crop, and exporters demand purity : hence the Department is making special efforts to ensure the cultivation of pure varieties.

The improved tobacco strain (No. 6 Gandiu) evolved at Nadiad, continues to give great satisfaction, and the area under it is being expanded in the district. This amounted to 120 acres in the year under report. The Department is also giving special attention to assisting Irrigators to take up tobacco cultivation on the Deccan Canals where a greater diversity of cropping is wanted.

Premium Bulls.—The demand for premium bulls has now much exceeded the supply. In the year under report the marginally noted bulls were put out on the premium system, and the total number of such bulls held under premium rules was 99.

Name of breed	Number of premium bulls issued
Kankrej ..	31
Others ..	19

Effect is given to the plan recommended by the Cattle Committee to concentrate all premium bulls within relatively small zones, specially selected as favourable for cattle breeding, and to make the rest of the country depend for its superior bull supply upon the stock bred in these special zones. In this way it is possible for the Livestock Expert to exercise adequate control in those localities where his services can be turned to best advantage. It also ensures that the bulls are located where they are most required.

Bunding—Field Embankments.—There is probably no agricultural improvement of greater value, in many parts of the

Presidency, than bunding. This is particularly true of the East Deccan and Karnatak. In these tracts the practice of bunding is an old one, but the manner in which the Department of Agriculture can render special service is in advising the people how to choose the correct alignments for their bunds and how to construct them with special reference to the waste weirs. Government have appointed an Officer of the Public Works Department to deal with comparatively large schemes of land development, but the Agricultural Department concentrates on the small schemes such as are undertaken by a single cultivator. There are now three whole-time graduate assistants employed on the work, and their services are in great demand as may be judged from the following figures. In Bijapur District 44 bunding schemes in 40 villages were dealt with. The estimated cost of these schemes amounted to Rs. 65,400. In the same district 22 schemes for the reclamation of small nala beds were prepared, while 90 executed schemes in 50 villages were inspected. In Belgaum District an excellent co-operative bunding scheme was completed at Tallar at a cost of Rs. 3,000. In the East Deccan plans were prepared for 22 bunding schemes estimated to cost Rs. 25,000.

Well-boring.—The Department has for many years, undertaken the boring of wells in all parts of the Presidency, and in the year under report, the work noted below was carried out in the different divisions :—

Name of Division	Number of bores undertaken	Number of successful bores	Total footage bored
Gujarat	43	26	2,510
Khandesh including Nasik	22	15	1,642
Deccan	78	35	6,451
Karnatak	130	82	6,439
Konkan	34	20	2,866
Total ..	307	178	19,908

Horticulture.—The work of the Horticultural Section is now widely appreciated throughout the Presidency and I give below the remarks recently received from the Superintendent of markets, Bombay, which indicate that substantial progress is being made with the improvement of fruits and vegetables in this Presidency, a result believed to be due, at least in part, to the efforts of the Department.

'I may inform you that the following fruits in my opinion are very much improved during the last couple of years :—

"Tomatoes"—First class now a days 50 per cent. better during the last few years.

"Guavas"—Much improved in size, taste and smell.

"Figs"—Improving in size and taste every year.

"Chickoo"—Big improvement in size and sweetness.

"Papaya"—Very big improvement in size, colour, sweetness and tenderness. Requires work to cut down seed content.

"Pomegranate"—Certainly improved in size, colour and size of granules.

"Sour limes"—Bigger and better colour'

Crop Protection.—The most serious pests to Bombay Agriculture in the year under report were insects (especially grass-hoppers and locusts), pigs, rats and certain plant diseases (notably cotton wilt). As regards the wingless grass-hoppers this pest is serious throughout the whole tract of country starting from Nasik in the North and ending with Dharwar District in the South. The most effective treatment is dragging tin sheets over the young cereal crops after smearing the upper surface of the sheet with tar. This treatment must be introduced very promptly, as soon as the pest manifests itself, and it must be applied over a substantial area of a few hundred acres, otherwise the fields soon become reinfested. This treatment was successfully adopted in the Shiggaon (Bankapur) Taluka. The cost per acre works out at Rs. 2 for six treatments which are recommended. The district staff of the Department are prepared to give every assistance in their power to cultivators who adopt this treatment. The Department employs one whole-time graduate assistant to organise anti-pig campaigns and his services are becoming increasingly popular. The procedure is for him, on invitation from a local authority, to visit a pig infested area and to prepare a plan of campaign. Funds are collected to which the Department contributes, and then the work of destruction is carried out. Below is summarised some of the principal results obtained in the year under report :—

Name of tract	Pigs killed	Cost per pig in rupees	Area in acres of crop protected	Total expenditure in rupees
Godavari Canals ("B" Section)	103	5 3 1	2,000 cane. 5,000 Jowar.	535
Godavari Canals ("C" Section)	115	4 7 1	5,040 cane.	512
Satara District (Palshi tract)	52	7 5 6	450 groundnut. 15 potatoes.	382

The Rat pest is particularly severe in South West Sind. A method has been worked out whereby the rat-holes are fumigated with Cyanogas. This is a very effective method of destroying rats provided it is used rationally. All burrows, and not some burrows, must be treated, and the area to which the treatment is applied must be substantial. Otherwise it easily becomes reinfected. Demonstration work carried on over several thousand acres proved quite successful and the cost of the treatment worked out at Re. 0-12-0 per acre. Every assistance in their power is given by the local Agricultural Officers to those who undertake this work.

Among plant diseases cotton wilt is developing on a considerable scale in certain tracts. At present the most effective means of controlling this disease is to cultivate wilt-resistant varieties. The Department is in a position to supply seed of such varieties, both in the Karnatak and Khandesh. The campaign against Jowar smut was again carried out in all Jowar-tracts with the aid of the Revenue Department. The Department hopes to be able to substitute a "dry-treatment" of the seed for the present steeping treatment in the near future.

Implements and Machinery.—Irrigators are now paying much more attention to machinery than they did a few years ago. The Power Crushing Mill and the Oil Engine are becoming quite common as may be judged from the fact that there are 52 power crushing plants on the Deccan Canals. This means, however, that the need for technical assistance is felt by those men especially as regards the selection of suitable machinery and its erection and maintenance. In the year under report the Department gave much assistance of the kind indicated by the following examples :—

(1) installing a 32 B. H. P. Blackstone crude oil engine and cane mill.

(2) installing a 24 B. H. P. Campbell crude oil engine and cane mill.

(3) installing a 12½ B. H. P. Shanks crude oil engine and cane mill.

The Department is also assisting local enterprise in developing tractor cultivation. Thus in the year under report the Department placed a new tractor and outfit at the disposal of the West Khandesh District and contributed half the cost to the purchase of a tractor by the Bijapur anti-famine Institute. Similarly those cultivators who depend on lifting water from

wells and rivers, require advice, as may be judged from recent examples quoted below —

(*a*) installing a 17 B. H. P. Blackstone crude oil engine and a 4" pulsometer pump at Shitaphali baugh in Poona District.

(*b*) installing a 2" high lift pulsometer pump and an 8 B. H. P. Semi-Diesel Petter Crude Oil engine at Rajewadi in Satara District.

Marketing.—Probably in no respect, does the agricultural public require more protection and assistance than in the marketing of produce. Hence the placing of the Cotton Markets Act on the Statute Book in January 1928 was a notable incident in the year under report and it is probably the forerunner of much similar legislation. Hitherto the chief assistance which the Department has been able to render in the sphere of marketing has been in placing the services of expert graders at the disposal of Co-operative Sale Societies, as at Hubli and Gadag and in organising the sale of lint, instead of kapas for the Surat cotton cultivators. These operations have been much appreciated by the public.

Co-operation with other Departments and Public Bodies

Many Government Departments are concerned indirectly with agriculture, including Revenue, Forests, Irrigation and Education. Hence it frequently happens that progress can only be achieved through co-operation with these Departments, and it is satisfactory to record that much useful work is being done on these lines.

The Revenue Department has been assisting this Department in many matters, of which I may refer to a few. The Jowar anti-smut campaign has been splendidly supported by leading Revenue Officers of the prant and taluka class. A very large number of our small one-day demonstrations have been conducted under the auspices of a Revenue officer engaged in jamabandi work. Co-ordination meetings of Revenue and Agricultural Officers have been held in a number of districts, usually presided over by the Collector. At these meetings Agricultural Officers outline the chief ways in which the Revenue officials can support or supplement their work. Many mamlatdars have given a very large amount of time to promoting the formation of and assisting the management of Taluka Development Associations.

The Agricultural Department has been co-operating with the Forest Department in several respects notably—

(*a*) in investing the possibilities of developing fruit growing under forest conditions.

(*b*) in improving forest grazing areas.

Thus that Department has placed 1,000 mango trees in a large tract of forest at the disposal of the Horticulturist who is converting these trees into good varieties through the process technically known as "top-working." There seems to be considerable scope for developing the growing of such fruits as the jambul in forest areas for supplying raw material from which to manufacture bottled juices.

The Economic Botanist is conducting experiments on forest grass lands at Jalgaon to test the possibilities of improving the system of managing these lands, more particularly the method of rational grazing, burning and delaying grazing for a few weeks, in the early parts of the Rains until the grass has had time to develop. One of the first improvements required on many forest grazing lands is the supply of drinking water. At the instance of Mr. MacMillan some very useful work has been done in West Khandesh on these lines.

The Forest Department is also rendering valuable service to Agriculture by making fencing posts available at cost price for the Co-operative Fencing Schemes which have been introduced against pig in the Karnatak. Similarly that Department is prepared to provide material at cost price for packing cases in connection with the better marketing of mangoes grown in the Konkan, which have to be transported by sea to the Bombay market.

The Irrigation Department has been co-operating with the Agricultural Department in promoting the diversity of cropping on the Deccan Canals. Hitherto the irrigator has depended too much on only one money crop, sugarcane, but owing to the slump in gul prices and also to broaden the basis of agriculture, efforts have been made in recent years to popularise other money crops such as cotton, ground-nuts and tobacco. Some of these crops, especially cotton, require special irrigation facilities, because the best time to sow is May, whereas the canal regulations do not provide water for kharif crops so early. Arrangements, however, have been made by the Irrigation Department to provide May water for cotton for a small additional charge of Rs. 5 per acre. Both Departments are also aiming at inducing the Irrigator to apply less water to his cane crop and to be more economical in his use of

artificial fertilisers. Another piece of co-operation between the two Departments is with regard to horticulture. Dr. Cheema has been given special facilities in a number of the compounds attached to Irrigation bungalows, and he is making use of this assistance by demonstrating which varieties of fruit to grow and how to manage an orchard.

The introduction of agricultural classes into rural schools, has necessitated the close collaboration of the Education and Agricultural Departments. The special teachers are trained by this Department and the curriculum has been framed largely on the advice of Agricultural Officers. The Inspector of Vernacular Agricultural Schools devotes a large part of his time to advising the teachers of the bias schools.

Boring operations and rural education bring the Agricultural Department into close touch with several of the District Local Boards, while Satara District Local Board has taken over the control of agricultural propaganda, subject to the general advice of this Department, with the aid of a technical staff placed at its disposal. Other Local Bodies with which this Department is collaborating include Municipalities possessing public gardens where valuable work can be done in organising nurseries for the supply of fruit stock, and Gowrakshaks which are adopting the breeding of valuable bulls under the guidance of the Livestock Expert.

Propaganda and Organisation.

In an earlier part of this report reference has been made to the many services which this Department is rendering to the public, but the latter requires to be educated in order to realize its wants. The improvements which are worked out as the result of careful research have to be brought to the notice of the public before the latter demands facilities and assistance to enable it to take advantage of the same. This subject has been very fully dealt with in previous reports and I will not cover the same ground again, but I will merely draw attention to new forms of propaganda which have been introduced or developed during the course of the year. Among these perhaps special classes for adults lasting for a few weeks, is the most significant. For some years the Department has been running a special sugarcane class at Manjri for a period of about three weeks during the crushing season. In the year under report this class was conducted at Baramati with very satisfactory results. It was attended by 50 cultivators and six Officers of the Irrigation Department. Similarly the Agricultural Engineer has been

conducting a special class for the training of men in the arrangements and running of simple machinery such as oil engines. During the year under report 14 cultivators took advantage of this class. A further development of this type of instruction has been the special horticultural classes held in Satara and in Surat District. These classes were attended by about one hundred adults and school boys.

As regards Shows the most interesting new development has been locating one of these shows at an important market. Thus the Horticulturist organised a Mango Show at the Crawford Market, Bombay, in May (11th and 12th) which was attended by some 16,000 persons, and which proved very popular among professional Mango growers. This Show brought out the facts that Salsette produces the best Alphonso mango and that Alphonso syrup is a very successful preserve.

A large district Show was held at Ahmednagar which was very successful, due largely to the effective demonstration of improved methods of cultivation. Results obtained on these demonstration plots include—

Kind of improvement	Yield of jowar grain in lbs. per acre	
	Treated	Not treated
Dry farming system	1,984	768
Wide-drilling 18" between rows	3,304	2,344
Grading seed ..	3,016	1,408

Altogether there were 28 Shows and 781 organised demonstrations held all over the Presidency during the year under report.

Many of the agricultural overseers are equipped with magic lanterns, but arrangements have also been made with two other Agencies for delivering magic lantern lectures on agriculture. One of these is Mr. V. S. Toro, the Educational Inspector for Visual Instruction. This officer organises an enormous number of illustrated lectures throughout the Presidency and this Department is gradually equipping him with agricultural material. In the year under report 20 such lectures on agricultural subjects were delivered. The other agency is the Gograss Gojivan Mandal, Bombay, which conduct lectures on cattle in the villages. This Department contributes a small subsidy to this scheme and 200 such lectures were delivered in different villages in the course of the year.

The department is doing all it can to foster and encourage local organisations for promoting agricultural progress. The most important bodies of this type are the Taluka Development Associations. The work of these Institutions has been on the same lines as those described in previous reports. Unfortunately this movement has received a severe check owing to financial stringency. During the year one association was cancelled and the present total number now stands at 81 and these are distributed as shown in Appendix A.

The Divisional Boards of Agriculture have continued to do useful work in guiding agricultural propaganda and controlling the activities of the Taluka Development Associations. In Satara District agricultural propaganda has been taken over by the District Local Board which controls the work of all the Taluka Development Associations. For this purpose the Department has lent the Board a trained staff of agricultural officers to give the system a thorough trial.

The Collector of Bijapur has organised an anti-famine Institute which aims at organising the whole district for agricultural improvement through the medium of village officers, and this Department is giving the Institute every assistance.

The Cotton Transport Act.

The application of this Act to certain zones has done a great deal of good. Unfortunately it was relaxed in 1926 as regards road transport between the north Tapti area and the south Tapti area of the Surat District. This has proved an unfortunate decision because much inferior cotton has crossed the Tapti and it has become imperative to re-impose the restrictions on road transport, which it is hoped will be done in the near future. It has become necessary to increase the number of road check stations in protected zones of the South of the Presidency and Government have now sanctioned 16 such posts. It has been found that a certain amount of "fly" is finding its way into the Kumpta-Dharwar protected zones, but the exact method of importation has not yet been discovered. Proposals are before Government to establish a protected zone in Middle Gujarat to safeguard the cotton of Broach from adulteration with the inferior cotton of Central India.

Research.

Most of the activities of the Department take their source in successful research. Without it, there can be little advancement in agriculture. Considered from this view-point the

Department is not as well equipped with front rank research workers as it should be. I will indicate below the principal research in progress.

On Soil.—The Agricultural Chemist has been engaged upon the investigation of the circumstances governing the natural additions of nitrogen to the soil. It has been ascertained that under certain conditions of moisture in the soil the fixation of atmospheric nitrogen takes place freely, and it has been shown that this process can be promoted by suitable tillage operations at the appropriate times.

The Acting Soil Physicist has been conducting investigations into the best methods of conserving moisture in the soil in the scanty rainfall tracts, and certain important results have been obtained showing how, in practice, the yields of bajri and rabi jowar can be increased notwithstanding the small rainfall by adopting methods within the reach of the cultivator. Some interesting figures showing increased yields obtained by these methods at the Nagar Show are recorded elsewhere in this report. The Soil Physicist in Sind is making an intensive study of the occurrence and movements of alkaline salts in the soil with a view to determining means and ways of combating the kalar (Alkaline) menace. The application of Calcium Chloride to the soil has given interesting results.

On Crops.—A great deal of attention is being bestowed upon the improvement of crops through Botanical Research. Selection and hybridization has resulted in a large number of improved strains of rice, cotton, wheat, jowar, bajri and tobacco being evolved. The improvement is largely in point of yield, especially in cereals ; but in cotton improvement in quality has also been secured. Among more recently evolved strains may be mentioned "Dhulia I" cotton in Khandesh which is a hybrid cotton capable of spinning 20s as against the 10s of the local variety. With bajri some of the improved strains are found to give greatly increased yields as compared with the ordinary type. With wheat good progress has been made in Sind in evolving some very high yielding strains. With rice similar progress has been made at Karjat in the Presidency proper and at Larkana in Sind. With tobacco the number 6 strain of Gandiu has become very popular in the Kaira district, where it yields 14 per cent. over the local type. Much research has been done on Sugarcane with regard to all aspects of the problem, but considerable space has been devoted to this work in previous reports,

so I shall not deal with it here but refer the reader to Appendix D.

On Stock.—Good progress is being made in improving the principal breeds of cattle. Thus at Chharodi the milk yield is going up rapidly, also the regularity of calving. Similar progress is being made at other centres. Bulls bred on these farms are issued on the premium system so that improvements are carried into the villages. Some work is also being done with sheep, and there seems to be great scope for improving the yield and quality of wool, judged by the results so far obtained. Similar work on poultry is in progress.

On Implements.—The Agricultural Engineer is now devoting more time to the improvement of implements, and his investigations into the improvement of the indigenous seed-drill, have proved very successful. He has evolved a greatly improved drill, on which the public will be able to pass judgment at the forthcoming Presidency Show at Ahmedabad. The work of the Agricultural Engineer is more fully dealt with elsewhere in this report.

On Plant Diseases.—The Plant-Pathologist has been devoting special attention to the use of chemical dusts in place of chemical sprays as a means of protecting crops from such diseases as smut and mildew. The use of "dust" is a much more simple operation and is also cheaper. A bulletin on the subject is in the press. The problem of Chilli disease in which the leaves become dwarfed and curled is a serious one and is now under careful investigation. It is suspected to be a form of mosaic disease. The problem of cotton wilt is the subject of a special research scheme at Dharwar financed by the Indian Central Cotton Committee. It has been found that there is a definite range of soil temperature below which and above which the associated *fusarium fungus* perishes. It has also been found that there is considerable scope for combating this disease through the evolution of resistant strains.

On Insects.—The problem of spotted boll-worm is also the subject of a special research scheme, at Surat, financed by the Indian Central Cotton Committee. It has been found that the caterpillar of this pest, passes down into the soil to pupate and that it cannot enter the soil if the latter is effectively mulched. The feasibility of controlling the pest through this discovery, is under investigation. Similarly Jowar borer is the subject of a special investigation, at Surat, financed by the Trustees of the Sir Sassoon David Trust Fund.

In Plant Physiology.—The curious phenomenon of the enormous shedding of buds and bolls by the cotton plant, is the subject of another special research scheme, at Surat, financed by the Indian Central Cotton Committee. It has been found that 80 to 90 per cent. of the flower-buds never develop into mature bolls. While a large part of the shedding appears to be natural and unavoidable, it is clear that part of it is caused by adverse factors, and there are indications that a considerable amount of control of these latter, is feasible. The Chief Investigator is hopeful that suitable ameliorative treatment will result in doubling the present production per unit of area.

Another research scheme upon cotton physiology financed by the Indian Central Cotton Committee, has been started at Sakrand. This deals with the reaction of the plant to irrigation. The optimum quantity of water and its best distribution as regards intervals between successive irrigations and at different stages of growth, are being studied under this scheme.

In Horticulture.—Considerable research is in progress, upon the preparation and manufacture of bottled juices from the common fruits of the Presidency such as lemon, jambul and pomegranate. Some very interesting research is in progress in the use of wild stocks on which to bud citrus fruits such as lemons and oranges. One of the most promising of these stocks is the Kawat (*Feronia elephantium*) and another is the Bel (*Aegle marmalos*). If this work proves successful then the scope for extension of cultivation is very great, because these are hardy trees which can grow under conditions quite unfavourable to the common stocks like jamburi and karna. These stocks, moreover, would probably ensure the immunity of these citrus fruit trees from the serious disease, known as "Die-back" which is usually associated with an unfavourable environment.

On Grazing Lands.—The Trustees of the Sir Sassoon David Trust are financing a research scheme for the improvement of grasslands. The two most important conclusions are that such improvement is practicable if

(*a*) the land can be protected by fencing or otherwise,

(*b*) rotational grazing is adopted.

It is clear that inferior mal-land cannot bear the capital outlay of fencing, and hence improvement measures have to be restricted to the more fertile areas. Successful examples of

rotational grazing may be seen at Jalgaon, Chharodi and Kandivlee.

On Mango Problems.—The importance of this crop is not always realized but the following area figures for the Konkan are significant :—

District	Acres	Percentage of total Presidency area
Ratnagiri	4,832	32·0
Bombay Suburban	1,715	11·3
Thana	1,226	8·0
North Kanara	1,086	7·1

The Trustees of the Sir Sassoon David Fund have also been financing a scheme for investigating mango blight. It is the common experience of mango-growers that the inflorescence becomes diseased—thus causing a serious diminution of crop. It has been found that this blight is due to two causes, an insect (three species of Idiocerus) and mildew (Erysiphe type). Sometimes both causes are present and sometimes only one. The study of the life-history of these insects and mildew, are still in progress and various preventive measures are being studied, including sprays and poison-dusts. The latter are promising and the economic side of these treatments is now under investigation. It has been found that where the crop is adequately protected from these pests, the outturns are very materially increased. The problem of bearing in alternate years is also under investigation. Preliminary observations indicate that there is a correlation between the growth of the branches at certain times of the year and the subsequent bearing. If this is confirmed the scope for controlling the branch-growth will be studied.

On Fertilisers.—Progress in the use of artificial fertilisers in this Presidency has been slow as dry-crops have not shown any very striking response to these fertilisers, and cotton is practically the only rain-fed crop which has benefitted therefrom. Success with cotton has been attained in Khandesh where a combination of sulphate of ammonia and cake has proved successful. A bulletin No. 143 has been issued describing the work carried out.

A wet-crop like rice on the other hand has shown substantial results from the application of sulphate of ammonia at the

rate of 300 lbs. per acre, applied after transplanting, in the North Konkan tract. Similarly this fertiliser has proved useful in the rice seed beds. On the laterite soils of the south Konkan and Kanara, bone-meal has done well in the case of rice. Among irrigated crops sulphate of ammonia is now an established fertiliser for sugarcane in the Deccan, while nitrate of soda has given good results on the onion crop. Experiments with some of the newer nitrogenous fertilisers like calcium cyanamide and ammophos do not indicate that they are markedly superior to the older and better known sulphate of ammonia, although the former of these fertilisers appears to be effective on fodder crops and grass-land.

Special research in Sind.

In view of the fact that a large part of Sind will be agriculturally transformed by the Barrage Canals System, which will give the country perennial irrigation in place of the present precarious supply from inundation canals, it is necessary to take stock of the many problems which will confront the cultivator under the new conditions. The existing methods of farming the country will be entirely out of place and unsuitable, and those who think that the only difference will be a larger area of crop, grown without anxiety about water, are mistaken. In the first few years there will probably be a tendency among many cultivators to cling to their present system and sow as much cotton and wheat and other cereals as the water supply may permit. Such farmers will soon find to their cost that their lands are rapidly becoming exhausted, and in many cases are developing considerable areas of kalar (alkaline soils). It is probably true that the agricultural aspect of the Barrage Scheme has been very dimly envisaged even by the leading men of the Province. With the small grant placed at its disposal for the investigation of problems arising out of the Lloyd Barrage Scheme, the Department of Agriculture has

(*a*) established an agricultural Research Station at Sakrand on the Left Bank where a perennial supply of water can be obtained,

(*b*) converted one of its existing farms into a Horticultural Research Station,

(*c*) organised Special Propaganda on a modest scale.

The Sakrand Research Station has been organised in sections. For the present the following sections have been established :—

(1) The Agricultural Section proper,

(2) The Botanical Section.

(3) The Chemical Section.

Under the Agricultural Section proper the two great problems, which are being dealt with, are

(*a*) how to conserve the fertility of the land under perennial irrigation, and

(*b*) how to control alkaline salts in a practical manner.

It is believed that the former of these problems will prove much more difficult of solution than in other provinces, such as the Punjab, where perennial irrigation has been introduced.

The Botanical section is dealing with the problem of finding or evolving the best varieties of strains of the principal field crops, considered from the standpoint of the new irrigation facilities. Satisfactory progress is being made with cotton, wheat, rice and jowar.

The work of the Chemical section is supplementary to the work of the Agricultural Section proper. In this section fundamental research is in progress connected with the formation and movements of injurious salts in the soil. It is also engaged in elucidating the exact causes of the decline in fertility of soils cropped with irrigated crops ; it appears that this is due, not merely to the depletion of plant food supplies, but is brought about by changes in the condition of the soil, rendering it less suitable for plant growth. There is an urgent need to add a "Mixed-Farming" section to the organisation of Sakrand, because preliminary work carried out at Sukkur has shown that the key to successful farming under perennial conditions lies in a happy blending of crop production with stock-keeping. It may in fact be found advisable, when disposing of Barrage lands, to impose a condition based on this plan.

The Horticultural Research Station is located at Mirpurkhas. There appears to be considerable scope for developing a fruit industry in Sind under perennial irrigation. The most promising commercial fruits suitable for Sind include dates, the citrus group and raisin grapes.

The Agricultural Engineering Section which is so necessary for the proper development of agriculture under Barrage conditions, has not yet been established. The post of Engineer has been sanctioned but funds are not yet available for providing his equipment. Similarly the problems of the Right Bank, especially those connected with rice, cannot be taken up until a suitable organisation has been set up as recommended by the Advisory Committee.

Agricultural Education.

The Poona Agricultural College has now entered upon its twentieth year, and it is as popular as ever. This year there are 79 students in the first year class. The total number on the roll of the College is 218. The demand for admission from all parts of India continues, but now we are limiting admission to about ten per cent. for students from outside the Presidency.

The most important feature of the examination for the B.Ag. in the year under report was the high percentage of failures. Out of 75 candidates only 38 passed, out of these 31 passed in the second class. Formerly a much higher percentage passed, and it is difficult to say whether the reason is the relative inferiority of the candidate or the relative sternness of the examiners, but there is reason to believe that it was at least partly due to the latter cause. It is also a matter for speculation whether the cause may lie in the new curriculum which has introduced specialisation among undergraduates. Thus in a group of ten B.Ag.'s it may so happen that no two have had the same training. The University Authorities have deliberately introduced this change and it will be interesting to see how far it proves a sound innovation.

Agricultural Schools.—In view of the recommendation of the Royal Commission it does not seem worth while at present to discuss in detail the working of these schools, but it may be said that the number remains at six, and the following statement summarises the attendances :—

Language	Name of School	Number of boys
Marathi ..	1. Loni (Poona District)	45
	2. Dhulia (West Khandesh)	30
	3. Jambul (Thana District)	23
Kanarese ..	1. Devi-Hosur (Dharwar District)	30
Gujarathi ..	1. Godhra	22
	2. Surat	30

Rural Bias Schools.—This Department continues to take an active interest in the attempts which are being made to improve rural education. This effort, however, has come at a rather unfavourable moment when rural education is in process of being handed over from Government control to Local Self-Government control. Thus these schools come under the administrative control of a number of different bodies, and it

is unlikely that all of them can take the same interest in the experiment that one central authority might be expected to show. Experience shows that these schools depend for success mainly upon the personality and talents of the teacher, and hence it seems essential to set up a training organisation which will ensure a supply of really good teachers. There are now 67 such schools, of which eight are in Sind.

Agricultural Engineering.

The importance of labour saving devices, in agriculture, is becoming more widely recognised in India, as a result of the rise in wages. It is only a few years since the first power cane-crushing mill was purchased by a cane-grower, but to-day there are 52 such mills in the Deccan Canals tract. Similarly the number of power-pumping plants is increasing as may be judged from the examples of installations in the year under report, quoted under the Propaganda section of this report. The largest field, however, for the Agricultural Engineer lies in the improvement of existing agricultural implements and the design of new ones. In this connection the Agricultural Engineer has been devoting special attention to the improvement of the indigenous seed-drill, and he has succeeded in evolving a greatly improved machine. At the present time drilling seed requires a small gang of men, women and bullocks, but this new drill requires only one man and one pair of bullocks, and the Agricultural Engineer estimates that its use enables a saving of about Rs. 5 per day. Another problem which is receiving special attention is the designing of a machine for harvesting ground-nuts. Preliminary trials with this machine also indicate that a considerable saving can be effected through its use. The operation of separating grain from chaff in certain windless tracts presents great difficulty, and the Agricultural Engineer has been making a special study of the design necessary for a winnowing machine which will give a clean sample of grain from Indian *bhusa*. Winnowing machines are designed to do much simpler work because the threshing machines remove all the straw whereas in India the grain, after threshing, remains mixed with the chaffed straw, and this has a strong tendency to cause great congestion if passed through an ordinary winnowing machine. The Agricultural Engineer has made considerable progress towards the solution of these difficulties.

Another problem under investigation is the use of the saw-gin for ginning Indian cottons. This type of gin gives a very

fine clean sample of cotton, but hitherto there has been a general complaint that it injures Indian cottons. The Agricultural Engineer is investigating the correctness of this contention with a view to making certain alterations in design.

Investigations connected with the material used in boring tools reveal the much greater efficiency of Blue Lath steel over ordinary Miners' drill steel, as it not only has a longer life, but the cutting parts remain sharp, twice as long. Arrangements have been made to get certain tools like drilling jars made at Dapuri workshop, which formerly had to be ordered out from the United States of America.

Agricultural Economics.

There is probably no branch of agricultural knowledge in which more confusion of thought exists than in the profits of agriculture, and this is particularly so in the case of India, where the subject of agricultural Economics has been so little studied. One frequently hears it stated that ordinary agriculture does not pay. This, if put forward as a general proposition, is untrue, and the explanation of this opinion frequently lies in the fact that the capital invested and the labour are not fully employed. It is obvious that agriculture can hardly be a business proposition if expensive machinery is used only for a few days or if the labour force is idle for several months of the year. Again the profits from agriculture may vanish if inferior animals are maintained, *e.g.*, many cows earn less than their food is worth. On the contrary, agriculture is generally a profitable undertaking, provided precautions are taken to see that the economics of the scheme are sound. It is now widely recognised that one of the main reasons for the unsatisfactory conditions of agriculture in many of the unirrigated tracts, is the large amount of spare time left on the hands of agriculturists; and economists have given very careful study to the solution of this problem, through looking for suitable subsidiary occupations for agriculturists. There is, however, very little exact information on record in support of these views. Hence one of the special investigations undertaken by the Professor of Agricultural Economics has been the collection of detailed information upon the diaries of typical cultivators' families. He has, with the co-operation of the teachers in two Bias Schools at Asoda in Khandesh and Jeur in Ahmednagar District, collected accurate data about the employment of families. One example may be quoted. At Asoda a khatedar possessing 17 acres of land with a well was selected;

he possessed one pair of bullocks, and the family consisted of two members (his wife and himself); but he employed two labourers. The farmer himself put in 337 days' work but he spent his time largely on supervision and in marketing vegetable produce. The two servants worked for 288 and 346 days respectively and the pair of cattle were employed for 282 days of the year, but the wife did no farm work. Data is now being collected with regard to farmers who possess no well, and when this is available it will be possible to realise, in concrete form, what has long been recognised in the abstract, namely, how enormously a well adds to the efficiency of agriculture, through providing more or less continous employment to the labour force.

It is of course true that every cultivator cannot provide his land with a well for want of under-ground water, but there are several other forms of land improvement on which he might fully employ his spare time with the aid of taccavi.

Another important line of investigation undertaken by the Professor of Agricultural Economics is study of "costs." It is obvious that it is almost impossible to arrive at the exact cost of production of any given crop because there is so much inter-dependence of crops: hence the problem is being tackled from the standpoint of making all the operations of a holding the unit of investigation. For this purpose four farmers have been selected in the villages of Nanded and Wadgaon, and a detailed financial record of each of their entire businesses is being maintained. From this data it will be possible to apportion roughly the cost of production per acre of each crop, and the results are expected to throw a useful light upon the economic position of the peasant farmer, and to reveal the weak points in his business, to the removal of which he can then address himself.

Another highly important branch of Economics is the marketing of produce. With the aid of the funds supplied by the Indian Central Cotton Committee valuable detailed investigations have been conducted into the marketing of cotton in Khandesh, Gujarat and Sind, with special reference to the inter-relation of finance and marketing. The results are being published by the Indian Central Cotton Committee; the contrasts which exist between these tracts are very remarkable; thus the average peasant cotton grower in Sind owning his own land, appears to be in bondage, while the Khandesh grower possesses very considerable financial strength.

A very practical economic problem has been brought forcibly to the front in the last year or two in the Deccan where much sugarcane is grown. The price of gul has slumped heavily while "costs" do not show a similar fall with the result that many cane growers find it difficult to make both ends meet, and the position is further aggravated by the consequent contraction of credit which renders it necessary for the co-operative financing societies to restrict loans, which under present conditions are essential for the carrying on of the industry. A solution seems to lie to some extent in the replacement of a part of the cane area by other money crops and this Department has been giving special attention to the popularisation of cotton, groundnuts and tobacco.

The question of turning Deccan cane, or at least part of it, into sugar instead of gul has also been receiving careful consideration. Government are considering a scheme put up by the Secretary of the Sugar Bureau at Pusa to establish a sugar corporation. The possibilities of a sugar industry on a village scale have also been explored, and some interesting results are recorded by the Deputy Director of Agriculture, South Central Division, on page 63 of this report.

The wheat problem in Sind raises an important economic issue, because a good deal of uncertainty exists with regard to the future of the world-market. Under the Barrage Canals Scheme, Sind will produce a very large surplus of wheat, but at present we do not know whether we should cater for the export market or the Indian market. In recent years the surplus Punjab crop has found an overseas market but this is due to its coming on to the market in the summer months when there is a slack supply from other wheat producing countries. Canada, however, is not only increasing her area, but she is regulating the placing of her crop on the market throughout the year. It seems not improbable that the time when India will cease to be a wheat exporting country, is not very far off. This tendency is gathering force from the change which is taking place in India itself, where a much larger home-consumption of wheat is taking place. It is these economic forces which have been largely responsible for such a marked fluctuation in the exports of wheat from India in recent years. The work of the Department on wheat improvement in Sind has been organised on a broad basis and it will be possible to give the grower not only a number of improved strains but the option of different varieties so that the Province will be in a position to adopt what the future market may demand.

Publicity.

The Department has published a large amount of literature in the course of the year as may be gauged from the list tabulated in Appendix V from which it will be seen that 15 bulletins and 24 leaflets have been issued. In addition 3 memoirs have been accepted for publication at Pusa, while numberless articles have been published in sundry periodicals. Although these publications are very valuable, they do not reach as large an audience as one would like, because they are technical, and the average educated man does not find much time for reading technical papers. If a really wide audience is to be reached, full use must be made of the press. But it is no use contributing articles to the press, even if the latter consents to publish them, unless they are written in a form which appeals to the layman. Unfortunately the capacity to write for the press is a talent which is not easily acquired by technical officers. Their training forces them into a too laboured style of treatment of their subject, and they use expressions not easily grasped by the newspaper reader. The material provided by the technical man should be converted into news before publication. Selection of salient points, brevity and simplicity of expression and making a subject interesting to an uninformed mind, are gifts largely the monopoly of a professional pressman. This was well recognised by the Bombay Board of Agriculture at its meeting in 1927, when it passed a strong resolution recommending the establishment of a Publicity Bureau under the part-time direction of a man experienced in the art of press-propaganda. Such a Bureau issuing to the press a constant stream of short interesting articles written in an attractive style could render a great service to the advancement of agriculture, because the ideas would reach the educated classes, who in turn would frequently refer to what they had read, in casual conversation with the less educated and illiterate masses, and thus would be sown the germ of information among the agricultural classes whom it is sought to reach, and who could then approach the nearest agricultural officer for further and more technical information or advice.

Statistics.

This Department has issued the usual forecasts of the principal crops of the Presidency, and at the instance of the Indian Central Cotton Committee, Government have decided to issue a fifth cotton forecast in the month of April each year, the first of

these was issued in the year under report. The need for this final forecast is due to the fact that the fourth forecast is issued in February which is too early for the reporters to form a final judgment upon the late varieties of cotton, especially in the Karnatak.

Special efforts are being made to improve the accuracy of these forecasts and we now have two means of checking the cotton figures from

(*a*) the information supplied by the Collectors of Districts in the month of July for the Crop and Season Report, and

(*b*) the Cotton Press Returns which are now made available through the operation of the "Cotton Ginning and Pressing Factories Act" of 1925. Under this Act the Owners of all cotton presses submit a weekly return of all the cotton bales pressed in their factories.

We are still, however, handicapped by the absence of full information about the movements of cotton from one tract to another. Hitherto the railborne traffic figures have dealt with exports only, whereas in the Bombay Presidency it is essential to obtain import figures. The Government of India have recently reconsidered the question and have agreed to record both imports and exports for the principal Trade Blocks, into which the country is divided. The Royal Commission have gone a step further and have commended the Madras suggestion that the unit of area for traffic statistics should be the Revenue District, and this is really what is required because other statistical information, such as annewari estimates, is recorded with reference to this unit, or even a sub-division of it. Hitherto all statistical work has been centred mainly on crop-production, livestock population and irrigation facilities, but the time has come when much more attention should be given to that branch of statistics which deals with agricultural progress. More diagrams, charts and graphs dealing with the introduction of agricultural improvements on the lines of those specially prepared for the first Presidency Agricultural Show held at Poona in 1926, are wanted. At present the Director's office is not equipped for this type of statistical work, but if the recommendation of the Royal Commission to appoint a full time statistician is accepted, it will be possible to undertake such work and keep the charts up-to-date. He would also deal with the problem of rainfall statistics which at present is very superficially and inadequately handled. Total figures of rainfall carry comparatively little significance. Some system of measuring

and recording effective rainfall must be devised. My predecessor personally tackled this problem, and got out some significant charts, but it is not possible to develop this investigation without a statistician.

Finance.

The expenditure of the Department amounted to Rs.17,08,600 during the financial year 1927-28 as against Rs. 16,46,200 in the previous year. The receipts amounted to Rs. 2,59,700 as against Rs. 2,78,100 in the previous year.

As regards the Personal Ledger Account, which is used for financing seeds, implements, etc., the total amount advanced was Rs. 1,36,855 while the recoveries credited during the year were Rs. 1,65,270.

	Rs.
(1) Bombay Gujarat Scheme ..	25,010
(2) Bombay Dharwar Scheme ..	23,090
(3) Earias Boll-worm Scheme ..	18,000
(4) Khandesh Cotton Breeding ..	5,000
(5) Sind Cotton Research Scheme.	16,160
(6) Finance of the Cotton Crop in Sind	6,500
(7) Finance of the Cotton Crop in Khandesh	5,000
(8) Finance of the Cotton Crop in Middle Gujarat ..	5,300
Total ..	1,04,060

Subsidies were received from the Indian Central Cotton Committee for the marginally noted schemes, to the amount of Rs. 1,04,060. The expenditure against this amounted to Rs. 95,235.

The following amounts were received during the year from the Sir Sassoon David Trustees :—

(1) Rs. 5,300 for investigations in connection with the improvement of grazing lands.
(2) ,, 4,570 for investigations in connection with drought resisting crops, especially bajri.
(3) ,, 5,000 for investigation of the mango problem.
(4) ,, 3,300 for jowar borer research.
(5) ,, 3,000 for grant at the rate of Rs. 500 to each of the six Vernacular Agricultural Schools.
(6) ,, 1,500 for the popularisation of artificial manures for the irrigated crops in the Deccan.
(7) ,, 2,935 for grant-in-aid to the Wilson Anti-Famine Institute at Bijapur for the purchase of a tractor.

Rs. 25,605 Total.

I have much pleasure in taking this opportunity to record the high appreciation of the Department of Agriculture for the

handsome donation of Rs. 30,000 by Bai Sakarbai Nusservanji to be spent upon the improvement of the Veterinary Hospital attached to the College of Agriculture in commemoration of of her late husband Nusservanji Sorabji.

ADMINISTRATION.

The most important change in the administration of the Department during the year was the retirement of Dr. Mann from the post of Director on reaching superannuation age. Dr. Mann was connected with the Bombay Department of Agriculture for twenty years, first as Principal of the College, and later as Director of Agriculture. He will, perhaps, be best remembered for his work as principal of the College. He was the first officer to hold this appointment, and his period of office extended over thirteen years. These were eventful years in the history of the College, as it was the formative period when the scope and character of the institution were being moulded, and when its reputation was being gradually and finally established. When his principalship terminated the College was attracting students not only from all parts of India, but also from Burma, Ceylon and Iraq. These College duties brought Dr. Mann into close touch with the Bombay University, on the Senate of which he was a prominent figure for many years. Dr. Mann's assumption of the Directorship of Agriculture synchronized with the advent of the reformed constitution, under the Government of India Act of 1919, under which the administration of agriculture passed into the hands of a Minister, chosen from the elected representatives of the people in the Legislative Council. In these circumstances Dr. Mann played a prominent part in giving effect to the fresh ideas brought to bear upon the Department of Agriculture by the first Minister of Agriculture, and certain notable advances were made, of which the following may be mentioned: (1) the organisation of local non-official bodies to promote agricultural propaganda and introduce improvement throughout the rural tracts, (2) the reform of rural education, to give an agricultural bias to the teaching in primary schools and (3) the great expansion of boring operations, especially in the famine-liable tracts. He was succeeded by Mr. T. F. Main on the 16th October 1927. At the same time Dr. Burns reverted from the post of Joint Director to his permanent position of Principal of the College of Agriculture, Rao Bahadur Patil, the acting Principal reverting. Several officers were on leave during the part of the year notably Dr. Burns (Economic Botanist) and Messrs. T. F. Main (Deputy Director of Agriculture, S. C. D.), B. S. Patel

(Professor of Agriculture, Agricultural College, Poona), W. M. Schutte (Agricultural Engineer to Government). Their acting vacancies were filled respectively by Mr. C. B. Patwardhan, Rao Saheb B. P. Vagholkar and Messrs. V. G. Gokhale and C. G. Paranjpye.

The following officers were on deputation throughout the year :—

Mr. W. J. Jenkins, with the Government of India.

Mr. G. S. Kulkarni, with the Indian Central Cotton Committee.

Mr. V. A. Tamhane and Mr. K. I. Thadani, under the Lloyd Barrage Agricultural Development Scheme.

Their positions were filled respectively by—

Mr. K. M. Pawar, Dr. B. N. Uppal, Mr N. V. Kanitkar, and Mr. B. B. Desai.

Since the retirement of Dr. Mann who was also Director of the Sakrand Agricultural Research Station I have discharged the duties of directing the work and development of that institution, while Mr. Tamhane, the senior residential officer, has discharged the duties of Officer-in-Charge. This is purely a make shift arrangement as the work at Sakrand demands much greater attention than I can give it. The other principal agricultural post in Sind, namely, the Deputy Director of the Province has not been filled by an Imperial Service Officer for four years. Hence the Department in Sind is not satisfactorily organised which is a matter for much regret, at this critical period in the agricultural history of the Province.

Apart from Sind the most pressing administrative need of the Department is the appointment of a Cotton Research Officer. The Department, as the result of gradual development, possesses a very extensive organisation for cotton research widely distributed over the Presidency, which is divided into sub-divisions each with an officer of Provincial rank in charge. In addition a number of special cotton research schemes each provided with its own organisation have been undertaken with the aid of subsidies from the Indian Central Cotton Committee. Hence at the present time we have the following quasi-independent organisations :—

The Cotton Breeder and staff for the Karnatak.

The Cotton Wilt Pathologist and staff at Dharwar.

The Cotton Breeder and staff for South Gujarat.

The Cotton Physiologist and staff at Surat.

The Cotton Boll-worm Entomologist at Surat.

The Cotton Breeder and staff for North Gujarat.

The Cotton Breeder and staff for Khandesh.

Apart from the very limited time that can be spared by Dr. Burns who is Principal of the College and Professor of Botany, these officers get little technical control and are all independent one of the other while they are addressing themselves to the solution of several diverse and difficult problems affecting the cotton crop of the Bombay Presidency, which in a good year occupies an area exceeding 8 million acres and embraces at least four of the main Trade Varieties of India. All of this work is highly technical and much of it is of an advanced character requiring the direction of an experienced specialist. It will thus be realised that Cotton Research in the Department is not only much more highly organised but is planned on a much more comprehensive scale than is the work of several of the other principal sections of the Department such as Livestock, Engineering and Horticulture. But each of these sections of the Department is under the whole time control of a first rank officer who directs and co-ordinates all the activities of his section. Hence it seems both reasonable and necessary that Cotton research should be given a Sectional Head in the form of a first class officer who would guide and co-ordinate the operations enumerated above.

T. F. MAIN,

Director of Agriculture,

Bombay Presidency, Poona.

APPENDIX A.

LIST OF TALUKA DEVELOPMENT ASSOCIATIONS ORGANISED UP TO DATE.

According to the scheme laid down in Government Resolution No. 3378, dated 5th June 1922, Revenue Department, 81 Taluka Development Associations have been formed until now as shown below :—

Gujarat Division.	
Surat District ..	3
Ahmedabad District	1
Kaira District ..	2
Khandesh and Nasik Division.	
East Khandesh District	10
West Khandesh District	7
Nasik District ..	5
South Central Division.	
Poona District ..	3
Sholapur District	3
Satara District ..	10
Southern Division.	
Belgaum District	4
Bijapur District	2
Dharwar District	6
Konkan Division.	
Kanara District	2
Ratnagiri District	3
Kolaba District	1
Thana District ..	4
Sind Division.	
Hyderabad District	4
Nawabshah District	1
Larkana District	2
Sukkur District	4
Thar and Parkar District	3
Karachi District	1

Out of the 81 Associations 11 were formed in the year 1922-23; 27 in the year 1923-24; 10 in the year 1924-25; 11 in the year 1925-26; 15 in the year 1926-27 and 8 in the year 1927-28. One Association, *viz.*, Alibag T. D. Association formed in the year 1923-24 was wound up in the month of October 1927. Subsidies amounting to Rs. 53,650 have been granted during the year under report.

APPENDIX B.

SUMMARY OF WORK DONE AT THE POONA AGRICULTURAL COLLEGE FOR THE YEAR 1927-28.

This is the twentieth year of the existence of the College.

Staff.

Dr. W. Burns reverted as Principal, on 16th October 1927, and went on leave for three months and twenty-one days from 1st June 1928. Rao Bahadur P. C. Patil, Professor of Agricultural Economics acted as Principal during the remaining period.

Rao Bahadur Professor P. C. Patil, Professor of Agricultural Economics was on leave from 5th April 1928 to 31st May 1928. Professor B. S. Patel acted in that place up to 9th May 1928, and Professor V. G. Gokhale for the remaining period.

Professor B. S. Patel, Professor of Agriculture, rejoined his duty on return from Australia on 26th November 1927. He was appointed Joint Deputy Director of Agriculture, Gujarat, from 9th May 1928. Mr. V. G. Gokhale, Deputy Director of Agriculture, Kokan, has been appointed to act as Professor of Agriculture.

Rao Bahadur Professor D. L. Sahasrabudhe, Professor of Chemistry, was on leave from 25th February 1928 to 13th June 1928. Mr. N. V. Kanitkar, Soil Physicist to Government, acted during the period.

Dr. G. S. Cheema, Horticulturist to Government, went on leave for one month from 11th May 1928. Mr. H. P. Paranjpe, the District Horticultural Officer, acted as Horticulturist to Government in addition to his own duties. Mr. S. R. Gandhi, demonstrator in Horticulture, was transferred to Mirpurkhas as Horticultural Officer.

Professor J. P. Trivedi, Professor of Agricultural Engineering, Physics and Mathematics, was on one month's leave from 29th January 1928 when Mr. A. A. Vasavada, Lecturer in Agricultural Engineering, Physics and Mathematics, acted in his place. Since May 15th, 1928, Professor J. P. Trivedi has proceeded on deputation for one year, as Irrigation Engineer, Bhavnagar State. Mr. A. A. Vasavada has been appointed to act. Mr. P. J. Patel, Demonstrator in Agricultural Engineering, Physics and Mathematics, has been appointed to act as Lecturer in place of Mr. A. A. Vasavada. Mr. K. M. Shah has been taken up as Demonstrator in Agricultural Engineering, Physics, etc. The services of Mr. M. B. Dave, Demonstrator in Agricultural Engineering, Physics, etc., were transferred to the Educational Department from 22nd June 1928.

Professor G. B. Patwardhan, Assistant Professor of Botany, was on leave from 11th April to 25th May 1928. Mr. L. B. Kulkarni was acting as Assistant Professor of Botany during his absence. Professor Patwardhan is appointed Professor of Botany from 1st June 1928 during the absence on leave of Dr. W. Burns and Mr. L. B. Kulkarni acts as Assistant Professor.

Professor T. N. Jhaveri, Assistant Professor of Entomology, went on leave from 7th May 1928 to 6th June 1928. Mr. V. G. Deshpande, Lecturer in Entomology, acted as Assistant Professor of Entomology during the period.

Professor G. K. Ranade, Assistant Professor of Agriculture, was on five months' leave from 1st May 1927. Mr. K. S. Kulkarni, Lecturer in Agriculture, acted as Assistant Professor of Agriculture from 3rd June 1927 to 30th September 1927.

Dr. B. N. Uppal continued to act as Plant Pathologist to Government during the year.

Examinations.

Of the 75 candidates who appeared for the B.Ag. examination in March 1928, 31 passed in second class and 7 in pass class.

Result of the Senior B.Ag., by optionals (1928).

(New Rules.)

Optional	New Rules		Exempted in optionals (1928)	Exempted in optionals (1927)
	Students appeared	Passed in all subjects		
(*a*) Intensive Study of certain crops ..	15	13	1	..
Last year's students of Intensive Study, etc.	4	1	..	2
(*b*) Advanced Plant Breeding ..	12	5	2	..
(*c*) Advanced Agricultural Chemistry ..	5	3	1	..
(*d*) Advanced Animal Husbandry and Dairying	3	1	1	..
(*e*) Advanced Agricultural Economics ..	7	4	2	..
Last year's students of Agricultural Economics	4	1	..	4
(*f*) Advanced Horticulture	11	4	4	..
Last year's students in Advanced Horticulture	6	4	..	6
(*g*) Advanced Plant Pathology ..	4	1	1	..
Last year's students in Advanced Plant Pathology	1	..	..	1
Old Course.				
Advanced Botany	2	1	..	..
Stock Breeding, Feeding and Dairying	1	..	..	..

Eighty students appeared for the I.Ag. Examination. Of these three passed in first class, 45 in second class and 11 in pass class.

At the final College examination for Diploma, five students appeared, out of whom three passed in second class. Three students appeared for the I.Ag. Examination in Diploma, out of whom two passed.

Students—(1928-29).

The following shows the number of students in the Senior B.Ag. and their optionals :—

		No.
(*a*) Intensive Study of certain crops	(Cotton group —4 (Sugarcane „ —6 (Rice „ —1	11
(*b*) Advanced Plant Breeding		15
(*c*) Advanced Agricultural Chemistry		5
(*d*) Advanced Animal Husbandry and Dairying ..		3
(*e*) Advanced Agricultural Economics		6
(*f*) Advanced Horticulture		12
(*g*) Advanced Plant Pathology		4
	Total ..	56

(Out of this 6 are failed students of last year.)

Junior B.Ag.

There are 64 students in Junior B.Ag. Class. Of these, three students have been directly promoted as two of them have passed B.Sc. examination with Botany and Chemistry, and one, a B.A., deputed by the Cochin State to take up a Diploma course in Agriculture for two years.

I.Ag.

Census was taken at the end of June 1928. Seventy-nine students were on the Roll. Seventy-two fresh students (65 from Bombay Presidency including Sind and 7 from outside), and 7 failed students, including men for Degree and Diploma.

M.Sc. students.

One M.Sc. student was taken up last year, for Plant Pathology, he left this year before completing the course. Besides one graduate was studying higher Chemistry and one higher Agricultural Economics for some time. Three students have been taken up during the year, one under the Plant Pathologist and the other under the Economic Botanist to Government and one under the Professor of Chemistry. One graduate is studying in Agricultural Economics.

Short Course.

Men who wish to take one year's training in practical Agriculture coupled with a small amount of training in allied sciences to grasp the principles of Agricultural Practice, are admitted to this course. Nineteen students were admitted during the year. Large number applied for admission but only 19 are taken.

A short course in Arboriculture was given to 8 Officers from Public Works Department.

Details.

The details of the students for the year 1928, are as under :—

	Number.
I.Ag. Class	79
Junior B.Ag. Class	64
Senior B.Ag. Class	56
Short Course Class	19
Total ..	218

Out of these 218 students, 188 are from Bombay Presidency. Fifty-eight are from Deccan and Khandesh, 50 from S. M. Country and Konkan, 57 from Gujerat and 23 from Sind. Of the remaining 30 students, 2 are from South India and Ceylon, 6 from Nizam's Dominions, 2 from Central India, 2 from Madras, 4 from Bengal, 4 from Goa, 3 from Travancore, 1 from Berars, 2 from C. P., 1 from Ajmer, 2 from Cochin and 1 from Andamans.

The classification of students also shows that out of 188 students from Bombay Presidency (including Sind), 54 (or 28·7 per cent.) came from the four chief Agricultural communities of the Presidency, *viz.*, Marathas, and Lingayats and Jains from the South and Patidars and Anavils from the North. Eighty-three students (or 44·1 per cent.) from the Brahmin community, 17 (or 9·04 per cent.) from Muslim, 7 (or 3·7 per cent.) from Christian, 9 (or 4·7 per cent.) from Parsi, and 48 (or 25·5 per cent.) from other communities.

Library.

The Library now numbers 13,305 Volumes. Out of which 202 books were added in the year 1927-28.

The following bulletins were issued by the members of the staff during the course of the year :—

1. Water-finder work in Bombay Presidency 2. Assimilation of nutrients by the Rice plant.	By Professor D. L. Sahasrabuddhe.
1. Sugarcane mills and small power crushers in the Bombay Presidency. 2. Furnaces for making gul in Bombay Presidency. 3. Organization and cost of Gul-making in the Deccan tracts.	By Professor P. C. Patil.
1. Studies in the cost of production of crop in the Deccan.	By Professor P. C. Patil and Messrs. T. G. Shirname and T. B. Pawar.

Visits.

The Honourable Mr. G. B. Pradhan presided at the annual Social Gathering of the College.

Dr. Carroll, Assistant Director of Research, Nitram Limited, Senor Devoto, Agricultural Expert, Argentine and Dr. Edmund Brunner of the Columbia University, were amongst the other visitors. Sir Chunilal Mehta visited the College and initiated new Rovers, and opened the Mandke Den for the College Rovers.

Athletics and Social Activities.

The various departments of the College gymkhana have done well during the year. The College won the championship Cup in the Inter-collegiate Sports held last year and ten other cups including cricket, tennis and volley ball.

The College furnished one platoon in the U. T. C., as usual. Mr. K. S. Kulkarni was in command.

Two troops of Rover scouts started in 1926 are maintained. Professor A. A. Vasavada is the Scoutmaster. Assistant Scout Commissioner J. P. Trivedi, and Scoutmaster Vasavada with 28 Rovers attended the Scout Jamboree held in Bombay last December.

The twin ideals of the College, Science and Sport continue to be pursued with the same zeal and the Esprit de Corps of the College grows daily.

College Veterinary Hospital.

The number of patients has increased since the last two years and improved treatments of patients continued.

P. C. PATIL,
Acting Principal,
College of Agriculture, Poona.

College of Agriculture,
Poona, July 28, 1928.

APPENDIX C.

Summary of the work done under the Deputy Director of Agriculture, North Central Division, Nasik, for the year 1927-28.

Staff and Organisation.

I held the charge of the Office of the Deputy Director of Agriculture, North Central Division, throughout the year and had the charge of the Inspector of Agricultural Schools in addition for one month. Mr. S. H. Prayag, Cotton Breeder, Khandesh, held the charge of Cotton Breeder, Surat, for 1½ months in addition to his own duties. Messrs. Bhagwat, Jambhekar and Pandit were on deputation for 6 months, during which period Messrs. Hanmar, Vaishampayan and Patil worked for them. During the deputation period Messrs. Moghe and Ghorpade worked as Cotton Supervisor and Farm Superintendent, Jalgaon, respectively.

2. The re-organisation of the Staff during the last two years resulted in more intensive and efficient work, but in spite of the efforts of the propaganda staff to cope with work, which has been much increased owing to the interest that is being aroused amongst the people, it has been noticed that the staff is inadequate for the purpose. In the last year's Report the necessity of two more graduates—one to tackle the problem of irrigated farming on Bandharas and Canals and the other for Field Bunding and embankment work—was pointed out is a great necessity.

3. The Annual Staff Conference was held at Nasik, when all the members, except the Cotton Breeder, being on duty in Gujerath, were present. In this Conference all the available data on plot experiments and trial were gone through carefully and the programme for the year 1928-29 was lined out on this data. In this Conference it was brought out that there is a great necessity of having two more graduates to deal with the problems of insect attacks and land bunding and embankments. Other important subjects discussed were—

(1) The working of Taluka Development Associations.

(2) Reorganisation of work, so as to be within the limited grants, for travelling and experiments.

(3) Destruction of wingless Grass-hoppers, etc.

4. *Peculiarities of the Season.*—The rainfall during the year was nearly equal or slightly above the normal and in some talukas like Nandurbar, Taloda talukas of the West Khandesh it was much above the normal, but the distribution was not even. Special features of the season were :—

(1) As compared with the last five years the rains began a fortnight earlier and the Kharif crops were sown in right time.

(2) There were good rains in the month of July and the Kharif crops had a good stand.

(3) There was rain practically every month from June to October in most of the talukas of East and two talukas of West-Khandesh, but in the remaining talukas as well as in Nasik District there was a long break from August till 16th of September.

(4) Owing to long break the growth of the Kharif crops was retarded and on the whole it had a bad effect on the yield.

(5) Again the rain in October spoiled the Kharif crops, specially those of Cotton, Jowar and Bajri. The quality of Cotton and that of Bajri and Jowar grains was spoiled.

(6) Rabi sowings of Wheat, Gram, Linseed, etc., were delayed by about a fortnight due to rains in October.

(7) The rains in October and November helped the Rabi crops, but damaged those of Kharif. The yields of Rabi crops, Wheat, Gram, Shalu Jowar, as obtained during the year are above normal.

(8) The yields of Kharif crop varied between 8 to 10 annas.

5. *Diseases.*—No serious pest on any Kharif crops was reported from Khandesh except few complaints about leaf curl disease on chillies in Khandesh and Nasik districts.

Serious trouble of rats to Rabi crops especially to wheat was reported from all the talukas growing dry and irrigated wheat in this Division and the yield, to a certain extent, was affected.

The wilt in Cotton tract was not so serious during the year.

The trouble from wingless Gross-hoppers has increased in Nasik District and has extended in three talukas. The Bajri crop was very seriously damaged, which has reduced the yield of grain to nil in certain places.

Research and Experiment.

6. *Cotton Crop improvement.*—The work of finding out new type approaching the yield of N. R. and having better staple and ginning was continued during the year under report. In addition, the following items were taken up for study.

(1) Root study of Khandesh Cotton.

(2) Hereditary characters of different types.

(3) Study of hybrids.

(4) Study of factors influencing yield and so on.

7. During the year under report BXX-27 (Dhulia 1) was given field trials on Jalgaon Farm and in districts in different conditions. These as well as strip trials on the Farms show that, as far as the yield of 1927-28 is concerned, Dhulia 1 is not in field conditions inferior in yield to N. R. but is on the whole slightly superior. It has kept up its high ginning capacity as well as fetches better prices than N. R.

The yield of Dhulia 1, per acre, on Jalgaon Farm and in districts is as under :—

	N. R., lbs.	Dhulia 1, lbs.	Increase or decrease lbs.
Jalgaon Farm	387	467	80
Phupnagari (Taluka Jalgaon)	340	400	60
Bharwas (Taluka Amalner)	246	315	69
Ranjangaon (Taluka Chalisgaon)	368	402	34

Wherever it was grown the cultivators were very much pleased with the Cotton and there is demand for the seed from all parts of Khandesh districts.

8. The other strain namely BXI-9 (34)—(Dhulia 2) which was under trial on field scale for the last two years proved to be a low yielder and is greatly susceptible to wilt. Owing to its great susceptibility further trials seem to be unnecessary and its extension is out of question.

9. In view of the results obtained it has been decided to extend the cultivation of Dhulia 1 cautiously and seed sufficient to 4,000 acres has been distributed in five talukas only and that too in concentrated areas.

10. *Hybridisation.*—The study of the F1 generation was taken up, which will be continued next year.

Farm and Experimental Station Work.

11. (*a*) *Jalgaon Farm, East Khandesh.*—This Farm was started as Seed Farm but as there is no other Farm in this Division the experimental work has been arranged on this Farm since last three years. With the addition of experimental work the Farm staff finds it rather hard to cope with the increased work. The staff consists of Farm Superintendent (Agricultural Graduate), one Non-Graduate Fieldman, a Store-keeper and one Mukadam. The Non-Graduate Fieldman is fully engaged in Account and Correspondence work and has no time to look to Farm work. To carry on the increased experimental work satisfactorily there is a great need of one more Non-Graduate Fieldman to look after the experimental work.

12. The following average crop yields per acre were obtained on Jalgaon Farm during the year under report :—

Cotton, 129 acres and 33¾ Gunthas .. 450 lbs. of Seed Cotton.
Groundnut, 23 acres and 7 Gunthas .. 1,700 lbs.
Jowar and Udid, 21 acres and ¾ Gunthas.
Jowar .. .. .. 946 lbs.
Udid .. .. .. 144 lbs.
Wheat, 15 acres .. .. 910 lbs.
Gram, 1 acre and 31½ Gunthas .. 497½ lbs.
Coriander, 2 acres .. .. 643¾ lbs.

13. The yield of Cotton of this year is lower than the average of the Farm due to the peculiar season, especially to rains in October, which spoiled the crop to a great extent. The yield of Jowar, namely, of 946 lbs. is low due to bore attack as well as heavy rains at the time of flowering. But all these yields are better than those obtained in the district.

14. The yield of 910 lbs. of Wheat is more than what was obtained in the past. All the Rabi crop yields are good and are more than what the people got in the district. These better yields clearly show what a soil, with good and timely treatment and with better rotation, can produce.

15. The investigation work on Cotton manuring was continued this year. Caster Cake as Cotton manure is being taken up by people largely in Jalgaon Taluka and many other Taluka Development Associations have taken the work of its extension. The work of finding out other substitutes was continued this year and the mixture, which showed good prospects of being economic, have given good results this year also. The mixtures are :—

(1) Groundnut Cake 200 lbs. *plus* Nitrate of Soda 50 lbs.

(2) Groundnut Cake 200 lbs. *plus* Sulphate of Ammonia 40 lbs.

(3) Seven Cart loads of Farm Yard manure *plus* 40 lbs. of Sulphate of Ammonia.

From the results obtained during past years it is found that these doses can safely be recommended for Cotton, per acre. Amonphos, which was tried in comparison with Caster Cake, has shown during the year under report, that 20/20 grade compares well with Caster Cake yield while the other, namely, 13/48 is slightly inferior.

In addition to the above following series were arranged to find out if the dose of 15 Cart load of Farm Yard Manure (usual dose of Farm Yard Manure) can with advantage be reduced without deteriorating the soil conditions.

(1) 7½ cart loads of Farm Yard Manure *plus* Caster Cake equal to the value of 7 cart loads of Farm Yard Manure.

(2) Groundnut husk, used in cattle byre for 20 days equal to Farm Yard Manure dose, namely, 15 cart loads.

(3) 7½ cart loads of Farm Yard Manure *plus* Groundnut Cake.

16. From the results obtained it can be said that these trials show promise of success. These trials will be continued.

17. With the high prices of Nitrate of Soda it has been found that the use of Nitrate of Soda in the mixture is proving uneconomic and unless the prices come down to Rs. 165 per ton at Jalgaon it will be an expensive manure.

18. The Groundnut cake mixtures stated above were tried in districts in different conditions and have given better results. The cost of the mixture, especially with the Sulphate of Ammonia, does not exceed Rs. 15 per acre. Wherever the price of Farm Yard Manure exceeds Rs. 1-8-0 per cart, this mixture can prove useful and if it is given in half

dose with 7 cart loads of Farm Yard Manure, it is found to be of more use. The trials are continued this year also.

19. *Groundnut.*—This was the fifth year of trial of the Groundnut Seed imported from America. The yield obtained from this seed was, equal to the yield from the old seed and there is practically no difference in the size of the pods, which was marked during last four years, but the pods from the new seed were of uniform size than those of old seed. From the results it can be said that the new seed keeps up its high yielding capacity for thre o to four years only and to maintain the superiority it will be advisible that the supply of seed is replenished every fourth year.

20. *Wheat.*—The work of testing the Wheat strains of the Crop Botanist to Government, B.P., Poona, was continued this year. Strain No. 224 like last three years has given better yield than local Bansi Wheat. There are two other strains namely 162 and 103 which nearly give equal yield with that of Bansi. Next year these three strains will be tried. But looking to the results of past three years it can be said that strain No. 224 will be suitable to the Jalgaon conditions and can be introduced. These strains are a bit late and as such may not be useful for tracts getting precarious rabi rains. The grain of all these strains is superior and fetches better price.

21. In addition, four strains of Pusa Wheat, were tried on the Jalgaon Farm but all of them gave a very low yield. Besides they were very badly damaged by rats. As this is the first year of the trial nothing can be said and the trial of these strains will be continued.

22. The experiments with Wheat as laid down in the year 1925-26 were continued. The experiments conducted were :—

(1) Wheat rolling.

(2) Double system of sowing Wheat.

(3) Packing the soil before sowing.

As there was rain practically every month the operations of rolling could not be done on prescribed dates and hence no conclusions can be drawn. In the case of double system of sowing no advantage was noticed.

23. *Khed Nursery.*—R. S. Gulabchand sold off his garden, where this nursery was located, during the year. The work has become very popular and there was offer from several persons to locate the nursery in their land. Ultimately the plants were divided into two places, Khed and Dhulia. Thus from this year two nursaries are being run with Dhulia as Head-quarters of the Horticultural Fieldman. All the plants have been sold and there are nearly 700 Jamburi plants ready for budding. The services of this Fieldman are indented by cultivators of both the Khandesh Districts. During the year under report he attended the budding of 80 Bor trees, pruning grape vine garden and treatment of several orchards.

24. *Belgaum Experimental Plot.*—As stated in the last year's report the work on this plot was restricted and the work during the year was continued on the same lines namely—

(1) Trial of Bajri, Nagli and Wheat varieties.

(2) Manuring of onions.

(3) Trial of Groundnut in comparison with Bajri.

(4) Trial of new crop like Suran.

Bajri.—The conclusion of last year about awned Bajri is corroborated by this year's results.

Nagli.—None of the introduced strains has shown their superiority in yield over the local.

25. *Wheat.*—This year fresh seed from Pusa of four strains namely Pusa 4, 12, 52 and 80·5 was brought and was grown under irrigation in comparison with local wheat. Pusa 4 tops the list as high yielder, next to it comes 12 and 52. These trials will be continued as this is the first year of the trial.

Following manures were tried for Onions:—

(1) Farm Yard Manure	.. 25 cart loads.
(2) Nitrate of Soda	.. 200 lbs. per acre.
(3) Caster Cake	.. 300 lbs. per acre.
(4) Mowra refuse	.. 30 cart loads.
Green manuring.	

Calcium Cynamide could not be used as it was not available.

Nitrate of Soda tops the list in giving more yield.

26. It has been found that Suran can be successfully grown in this locality and arrangements will be made to popularize this as well as potato crop.

27. Growing of Onions for seed 18" apart has again given better results this year also. With top dressing with Nitrate of Soda we get better and more seed per acre.

28. *Sangvi Cattle Breeding Farm.*—This Farm was started by the Agricultural Association, Shirpur and was run by them till 7th May 1927, when it was handed over to the Agricultural Department. This Farm was started to breed the Tapti Khillari Breed. At present there are 34 cows, 13 male calves, 20 female calves and 2 bulls. The Coup obtained from Forest Department for grazing the cattle has no fencing and as such there is fear of mixing the Farm cattle with those of villages, which have mixed cattle, which needs some consideration in the near future, if the purity of the breed is to be maintained. Besides this there are no quarters for the staff on the Farm nor can they get any quarters in the village. The Farm has no Kuran of its own from which it can cut grass for feeding, but has to depend on the local supply. There is much trouble from panthers and this year we have lost four animals. The

Farm was visited by the Livestock Expert and his remarks are as under :—

"The whole Farm has improved considerably especially the cattle, of which the condition was very good. The cattle are now tame and can be tied.

* * * *

Instructions were issued how to deal with the Foot and mouth outbreak.

More protection is essential, as a number of calves have been carried away by panthers."

District Work

29. The work done in district is given in a very concise form as it is not possible to give all the details owing to the limit of pages for the purpose. The District work consists of :—

(1) Verification of results obtained in previous year.

(2) Trial of new manures.

(3) Popularising of Akola Bajri, Pusa Wheat, especially No. 4, Castor Cake and Groundnut Cake mixtures as manure for Cotton, Sulphate of Ammonia for Sugarcane and rice, and Nitrate of Soda for onion and garlic.

(4) Trial of Wheat strains of Crop Botanist as well as from Pusa.

(5) Work on Wheat on Transtapti area.

(6) Special inquiries on crops.

To carry on this work successfully help of all Taluka Development Associations, Private individuals as well as of Officers of different Departments was freely taken.

30. The experimental work was continued with the following crops :—

(1) Cotton :—

(*a*) Manurial experiments with—

1. Groundnut cake *plus* Nitrate of Soda.
   200 lbs. 50 lbs.
2. Groundnut cake *plus* Sulphate of Ammonia.
   200 lbs. 40 lbs.
3. Caster Cake 300 lbs.
4. Seven cart loads of Farm Yard Manure *plus* 40 lbs. of Sulphate of Ammonia.
5. Eight cart loads *plus* half the dose of 1 or 2.
6. Calcium Cynamide—112 lbs.

(*b*) Trial of new strains namely Dhulia 1 and Dhulia 2.

31. From the results obtained it can be said that the mixtures tried under manurial experiments have confirmed the results of the last year and show great promise of being useful. However trials have been

arranged this year also. In all cases these mixtures have paid more than their cost.

32. As regards the trials of the new strains namely Dhulia 1, it has been found that it is in no way inferior to local N.R., but to a certain extent superior to N.R. It has been arranged to grow it on a larger scale in concentrated areas.

33. *Wheat.*—This is an important crop in this Division especially in Nasik District and Transtapti Talukas of West Khandesh. The scheme as laid down during the last year was carried this year also. In addition the trial of Crop Botanist's strains as well as of Pusa Wheat was taken up.

34. This is the second year of the scheme and needs more trial to draw out definite conclusions. Following provisional conclusions can be drawn from the results obtained during last two years.

(1) Planking Wheat crop three weeks after sowing gives better outturn.

(2) Pusa wheat, especially No. 4 and 80·5 shreds their grain at the time of harvest.

(3) In the case of irrigated wheat double sowing gives better outturn than single sowing, which is the local practise in Transtapti tract.

(4) Under irrigation Pusa No. 4 gives better outturn than local in Nasik as well as in West Khandesh.

(5) Pusa wheat is not affected by rust and has great demand in irrigated tract. Pusa wheat gives less fodder than the local but gives more grain.

(6) The three strains of the Crop Botanist, Poona, were tried in West and East Khandesh and also in Nasik District. These strains give different results in different districts.

Strain No. 224 show some prospect of being useful for Jalgaon tract.

Strain No. 162 gives better results in Transtapti area and strain No. 103 shows some prospects in Nasik District. It has been observed that all these strains are late by a fortnight than local.

(7) The manurial trial on irrigated wheat was conducted with the following manures or mixtures :—

(*a*) Caster Cake—300 lbs. per acre.
(*b*) Calcium Cynamide—112 lbs. per acre.
(*c*) Nitrate of Soda—112 lbs. per acre.
(*d*) Mixture of—
Caster Cake—150 lbs.
Sulphate of Ammonia—56 lbs.
Superphosphate—112 lbs.

35. In all these trials it was observed that except the mixture none of the manure have paid up their extra cost. Some of them namely

Caster cake has paid a little over the extra cost but the mixture shows some prospect of being economic. These trials will be continued to corroborate the results.

36. *Rice.*—The work carried out is on three lines, *viz.* :—

(1) Use of Sulphate of Ammonia as rab substitute.

(2) Use of artificial manures as field manures.

(3) Trial of better strains like Kolumba Nos. 42 and 79.

The work in Sakri Taluka about reduction in seed rate was continued.

The use of Sulphate of Ammonia is being largely taken up by people in Igatpuri Taluka of the Nasik District and the sale during the year was over 8,000 lbs. and private merchants as well as the Co-operative Union, Igatpuri, have taken up the question of selling the manures. Poudrette as well as night soil was tried this year in Igatpuri Taluka and the results obtained are encouraging. Next to this manure comes Sulphate of Ammonia.

36. During the year under report Kolumba strain No. 79, which is early, was given a trial in comparison with local early variety namely Varangal. The new strain is found superior to the local, but this will have to be confirmed by further trials. Kolumba No. 42 was tried with fresh as well as localised seed. The conclusion, namely the yield of Kolumba 42 goes down with period, was corroborated and it seems that the seed will have to be replaced every third year in order to get better yield from the strain.

37. The work on trials with reduced seed sale at Sakri was continued and the results corroborate those of the last year namely seed rate can be reduced with advantage and further corroborative trials will be continued.

38. *Chillies.*—The trials with Caster cake as top-dressing for Chillies were continued. It was given six weeks after planting dose being 400 and 600 lbs. per acre according to the previous treatment with Farm Yard manure. The net profit obtained due to the treatment varied between Rs. 15 to Rs. 20 per acre. People have been convinced and it is expected that people will come forward to use the manure.

39. *Sugarcane.*—The propaganda of wide planting of Sugarcane was very successfully carried out in West Khandesh and Nasik Districts. The use of Sulphate of Ammonia and cake as top-dressing has extended to a great extent. All the sixteen villages on Kadva Canal are now using Sulphate of Ammonia as well as all big centres in West-Khandesh.

40. The trial of S 48 has come out successful in all centres growing Khadya cane and as a result the demand for the sets is increasing. In Sinnar Taluka alone the area has gone over ten acres within these two years. Dry cultivation of Sugarcane in Igatpuri Taluka has gone down.

The complaint was that seed is not within the reach of ordinary cultivator and hence arrangements were made to supply seed for 4 acres in three places. Looking to the observations made during the last two years it can be said that the real cause of decrease in the area is the trouble from white ants which damage the crop very badly during April, May and June, damage being over 50 per cent.

41. Demonstration of Poona furnace for boiling was very successfully carried in Chandor Taluka of the Nasik District which resulted in building 10 new furnaces for the cultivators.

Onion and Garlic.—Nitrate of Soda has become a popular manure for these crops and is being very largely used in Nasik District, dose being 200 lbs. per acre. The increase in price will have some effect on its further extension.

42. The area under potato crop is extending in Nasik District as it is proving a paying crop.

Miscellaneous.

43. *Chaff Cutters.*—The Kadbi in Khandesh is rather hard and as such there is great wastage in the fodder. In order to save this wastage, for which there is great necessity, use of Chaff cutters was demonstrated. As reported in the last year's Report, this work was started from the special grant for the purpose. The use of hand power chaff-cutters was demonstrated in more than 50 villages. As a result of last year's demonstration of power chaff-cutter there was a great demand for the same from both the Khandesh Districts. The plant could not cope with the work and other portable plant at a cost of Rs. 1,702-7-0 had to be purchased, and both of these machines were used for demonstration. The people have much appreciated the work and there is great demand from the people who are keen in getting their kadbi chaffed. These plants will prove useful.

44. In addition to the propaganda and experimental work the District Staff took up the following works :—

(1) Survey of the Bhil tract in Nandurbar and Taloda Talukas.

(2) Arranged for and conducted the Fieldmans' Class.

(3) Arranged for the civilians' Anna Valuation Class.

(4) Continued the work of Groundnut mixture inquiry.

As a result of inquiry into the Bhil tract it was found that a special Kamgar is necessary to deal with the problems which need early attention. The Director had sanctioned a temporary appointment for nine months and during the period he did good work and has created a demand for improved seed and for ploughs. He conducted 16 plough demonstrations, which resulted in getting demand from 4 important villages. Good work can be done, if a Kamgar is posted permanently in the tract.

45. Besides these there are other problems such as out of season planting of Onions, suitable type of onions for each season, etc., which are still under investigation.

Propaganda.

46. The work of the Divisional Board came again to the Deputy Director from November 1927, as per new arrangements. There were three Meetings of the Board during the year under report and several subjects of importance were discussed, chief amongst them being the improvement in the working of the Taluka Development Associations, Railway concessions in manure freights and so on. During this year there was change in the personel of the members.

Taluka Development Associations.

47. There are in all 22 Associations in this Division, of which 11 are newly started while others are of old standing. There are only two Talukas in the East and only one in West which has no Taluka Development Association. However for Jamner, Association has been formed and work has been started by the Kamgar newly appointed. This Association will be sent for registration as soon as sufficient amount, to ensure its permanent working, is collected. Most of these Associations are getting an annual subsidy of Rs. 1,000 from Government. The old Associations are managing their own work, when an annual programme is given to them with occasional guidance. The work of these Associations is going on satisfactorily. The newly started Associations require special attention and guidance from the Officers of the Agricultural Department, and all possible help is given to bring their work to the mark. Some of these Associations are badly in need of more funds to carry on their work properly.

48. The details of the working of these Associations have been fully given in previous reports but some of these Associations have taken up additional work. Special mention can be made of the Associations at Bhusaval, Jalgaon and Pachora which are taking up the question of cattle improvement in their own Taluka. Good work has been done by the Jalgaon, Pachora, Nasik, Dhulia and Kadwa Canals in distribution of seeds and manures. These Associations are getting popular and the collections are satisfactory in many cases.

49. The Implement Depôts managed by the Department have all been handed over to these Associations in their own areas and are doing good work. Some of the Associations like Jalgaon, Pachora and Dhulia have two Depôts under two different men to satisfy the increased demands from the members.

50. The statement given below will show the amount collected by the Associations and main items of expenditure.

Statement showing information about the Taluka Development Associations in the North Central Division (Amounts collected, and main items of expenditure), for the year 1927-28.

Name of Taluka Development Association.	Balance *plus* amount collected.	Government subsidy.	Amount spent	
			Establishment and Office.	Implements, etc.
1	2	3	4	5
	Rs. a. p.	Rs.	Rs. a. p.	Rs. a. p.
Nasik District.				
1. Nasik	7,787 12 2	1,000	1,257 15 6	19 8 0
2. *Yeola	(1,856 1 3)	*Newly started.		(40 0 0)
3. Malegaon	750 0 0	716	489 10 6	325 4 9
4. Kadwa Canals	7,847 9 1	626	608 10 6	209 5 0
5. Satana	583 14 6	573	576 0 0	629 3 0
West Khandesh District.				
6. Dhulia	9,534 0 0	1,000	1,927 0 0	110 0 0
7. Sindkheda	4,564 1 9	912	693 0 0	215 1 0
8. Shahada..	4,141 4 9	1,000	814 11 6	112 4 0
9. Sakri	4,983 7 9	1,000	578 0 6	....
10. Shirpur	3,949 0 0	800	16 2 0	....
11. Nandurbar	1,991 12 6	1,000	744 0 0	98 0 0
12. Taloda	3,226 1 11	620	1,145 14 0	164 11 3
East Khandesh District.				
13. Jalgaon	20,397 0 0	1,000	2,018 5 9	359 13 9
14. Erandol	1,903 0 0	1,000	292 10 0	302 11 0
15. Pachora	22,270 4 0	1,000	2,818 15 0	100 0 0
16. Chalisgaon	2,731 0 0	1,000	449 4 3	662 6 6
17. Raver	8,385 15 10	1,000	1,477 2 9	161 12 0
18. Bhusawal	8,583 2 3	481	1,554 0 3	114 10 6
19. Yawal	1,905 14 11	1,000	317 0 0	216 1 0
20. Amalner..	1,126 13 11	926	220 15 8	210 12 0
21. Chopda	2,553 13 3	1,000	189 11 0	31 7 0
22. Edlabad	1,811 9 2	638	589 4 6	200 10 0

Name of Taluka Development Association.	Amount spent—*contd.*			Number of plots arranged.	Number of Demonstrations held.
	Manures seeds, etc.	Demonstrations.	Other charges.		
1	6	7	8	9	10
	Rs. a. p.	Rs. a. p.	Rs. a. p.		
Nasik District.					
1. Nasik	5,462 12 5	1,002 13 6	758 3 3	26	6
2. *Yeola	....	....	(31 11 9)	..	..
3. Malegaon	876 8 6	16 12 9	29 7 3	43	4
4. Kadwa Canals	4,885 10 6	148 11 3	379 5 9	32	22
5. Satara	1,545 3 0	80 0 0	273 8 6	35	9
West Khandesh District.					
6. Dhulia	779 0 0	296 0 0	343 0 0	30	3
7. Sindkheda	904 4 0	119 4 0	147 2 0	17	10 Big 12 small
8. Shahada	143 13 3	1 12 0	186 12 0	45	38
9. Sakri	1,135 3 0	109 14 0	382 14 6	49	59
10. Shirpur	....	....	12 0 0	2	12
11. Nandurbar	516 0 0	284 0 0	1,349 12 6	25	16
12. Taloda	250 15 0	....	272 2 0	10	..
East Khandesh District.					
13. Jalgaon	4,718 1 0	364 2 6	218 4 0	99	70
14. Erandol	28 9 0	....	35 6 0	15	37
15. Pachora	239 4 0	32 14 0	561 4 11	129	42
16. Chalisgaon	43 14 0	....	127 7 0	..	..
17. Raver	215 0 0	5 0 0	660 10 0	80	25
18. Bhusawal	77 8 0	98 13 0	2,313 0 9	20	25
19. Yawal	86 14 0	14 0 0	18 5 6	14	4
20. Amalner	39 11 6	30 3 8	....	7	17
21. Chopda	460 10 0	....	11 2 0	3	3
22. Edlabad	176 11 6	....	731 9 6	26	3

51. Most of the Associations have taken the advantage of the new system of collecting the subscriptions through the Village Officers as it has been found to be more useful and less troublesome. It liberates the Fieldman or the Kamgar to attend to his propaganda work. There is some improvement in the financial condition of some of the Associations. In Nasik District some help was given by the District Local Board to the Associations in the District, but the Khandesh Boards have not yet done so.

Non-Credit Work.

52. The work of pig proof wire fencing was completed and was handed over to the people of the Dhadne village of the Sakri Taluka in West Khandesh.

53. The Seed and Manure Society at Dabhadi is doing good work and it is expected will develop its work rapidly.

54. The Onion Sale Society had made a good beginning and in spite of the opposition from the local merchants has done good work. It had erected stores which were given on hire to the members to store their onions. The Society managed to dispose of nearly 500 khandis of onions. The annual income of the Society was Rs. 388 from hire as well as from commission. There was a loss which is bound to be, as it was the first year of its work. It is very creditable to the management to have the work done economically. This year the Society has five stores of which four are full, while the fifth is nearly full and it is expected that the Society will make both the ends meet, if all goes on satisfactorily.

55. In order to make such concerns a success it is necessary to have some good and reliable organisation in Bombay, so that the produce can be sent with confidence, since the dealing in such co-operative organisation are expected to be fair.

56. *Departmental work.*—A demonstration on a pretty big scale was organised through the assistance of the Taluka Development Association, Nasik, at Trimbak at the time of Nivrati fair in January 1928. Over 10,000 people visited the Show. The items of interest for the local people were Bunding of rice fields, manures for rice, Road scraper work and use of better rice seed, while of general were the preparation of Shirka from Sugarcane juice, preparation and preservation of Lime juice, use of Sulphur as preventive against grape mildew, working of Persian wheel and iron ploughs, etc.

57. Another Show of interest for grape-growers was organised at Nasik in which the useful varieties of grapes as well as methods of packing for despatch for long distances and of treatment against mildew were demonstrated. Lectures were arranged in which details of pruning and advantage of sulphur dusting was fully brought to the notice of the people. The Show was attended by most of the grape vine growers in

Nasik District. Besides these, following additional demonstrations were organised :—

Serial Number	Kind of Demonstrations	Number	Attendance
1	Crop demonstrations	25	Over 2,000.
2	Implement demonstrations	45	Over 1,000.
3	Hand Chaff cutting demonstrations.. ..	15	Nearly 300
4	Power Chaff cutting demonstrations ..	6	Nearly 5,000.
5	Site demonstrations	1	125
6	Cane crushing demonstrations	4	600
7	Poona Furnace demonstrations	9	Over 300.

58. Besides these nearly 25 *jamabandi* Demonstrations were arranged which were mostly presided over by the Prant Officers, while six were presided by the Collector. In addition to these, many demonstrations were arranged by the Taluka Development Associations in their respective areas. These were arranged on the plots conducted by the Associations and the improvements were shown to the people.

59. As a result of crop demonstrations a demand has been created for Dhulia 1 seed, Sulphate of Ammonia, Caster cake, seed of Spanish Peanut, Persian wheel, Nitrate of Soda and of iron ploughs. There is a large demand for Akola Bajri seed and Pusa-4 wheat and of Kolumba strains, especially early, and 42.

60. Owing to limited funds this work was restricted to small demonstrations. It is through demonstrations, whether small or big, we can bring the improvements to the notice of the people and as such, needs sufficient funds for this purpose.

Service.

61-A. Extension of N. R. and Dhulia 1 Cotton.—This work is being done through the same agencies as are reported in previous reports.

The first class seed produced on Jalgaon Farm was 20,000 lbs. The total distribution of N.R. seed was as under :—

	Lbs.
1st class N.R. Seed from Jalgaon and Dhulia Farms ..	20,000
2nd class N.R. purchased and supplied by Department ..	96,125
2nd and 3rd class seed produced on cultivators Farms by Taluka Development Associations, secured and distributed by the Department	1,79,575
1st class N.R. issued from Government Farms, Jalgaon and Dhulia during the year 1928-29..	19,475
	3,15,175

62. The first class seed was distributed to Taluka Development Associations, Co-operative Societies and Banks, who distributed it amongst their members keeping in mind to keep the seed in concentrated areas, as outlined last year.

The village scheme of distribution proved very useful as it was less costly to purify the seed as well as easy for supervision and collection at the time of ginning. The seed growers had their own share of seed which was sold by them. Thus the actual quantity of seed grown under departmental supervision was nearly five lakhs of lbs., which is all gone for seed. Besides this seed there were other cultivators, who got their seed purified either by departmental officers or by Kamgars of the Associations. The area covered by the seed supplied by Department comes to nearly 19,800 acres, while the actual may go over two lakhs.

63. The quantity of 19475 lbs. of first class N.R. Seed from Jalgaon and Dhulia Farms, during the year 1928-29, is given to 15 Taluka Development Associations, 2 Seed Societies and 2895 lbs. sent out of this Division for experimental work or for distribution.

64. Trial and extension of Dhulia 1 Cotton.—Dhulia 1 was found useful in trials on Jalgaon Farm and its trial on a large scale was decided. This was grown on 612 acres, besides those under irrigation or on plot trials, in three villages. This crop has given a bit high yield than N.R. and the growers are pleased with the Cotton. The work of purification was done by the Department and the Cotton was ginned under the supervision of the departmental staff. The Department has purchased 60,590 lbs. leaving nearly half of the seed with the growers for their own use. The quantity of 60,590 lbs. of seed has been distributed as under :—

		Acres.
Four villages in Jalgaon Taluka ..	16,380	819
One village in Bhusaval Taluka ..	4,160	208
One village in Chalisgaon Taluka ..	2,520	126
Seven villages in Amalner Taluka ..	18,850	942½
Two Villages in Pachora Taluka ..	15,210	760½

In addition to this, 5,000 lbs. first class seed produced on the Jalgaon Farm is given to one village in Jalgaon Taluka. The total area grown with this seed will be about 4,000 acres, which will be kept under the direct control of the Department for purification as well as ginning.

65-B. *Extension of Akola Bajri Seed.*—The cultivators in all the three districts have appreciated the value of Akola Bajri for seed and there is great demand for the seed from all the Associations as well as from individuals. This year all the demands could not be satisfied as the last season had spoiled the crop and good seed was not available in quantity.

66-C. *Implement Depots.*—There are only 10 Depots maintained by the Department. Two Depots have been handed over to the new Taluka Development Associations. These Depots serve to provide implements on hire, sell manures, seeds, etc. The hire received during the year is over Rs. 550. These Depots serve as centres of distribution as well as of information and are very popular.

67. *Crop Protection.*—The trouble from wild pigs is on increase in parts of East-Khandesh, West-Khandesh and Nasik Districts.

The fencing work of the Dhadne Society was completed and handed over to the Society. The work of Demonstration fence at Madki Jamb in Dineori Taluka of the Nasik District is nearly complete. Pig poisoning was continued, but it was not very successful. The Raver Taluka Development Association has purchased 2 guns and have kept in the Taluka to destroy pigs.

68. Owing to serious troubles from rats to wheat crops, poisoning with Arsenic was successfully carried in two places. At one centre cynagos was tried on irrigated wheat where the effect was good. It could not be tried in dry areas, though found useful, since there were big cracks throughout the field and as such it would not have been very useful.

69. *Trial of Tractor ploughing in West-Khandesh.*—Owing to constant demand from the people of the West Khandesh Associations a tractor with a set of three ploughs was kept at the disposal of the Deputy Director. The Tractor purchased is Mackormic Deering of International Harvesting Company. This Tractor has worked in seven villages in two Talukas namely Dhulia and Sakri and has ploughed 394 acres and 11 gunthas of land, in four and half months. The total expenditure from November till June end came to Rs. 3,087-7-0 including cost of new shares, bolts, charges for taking tractor from place to place as well as on two demonstrations, bonus and pay to the driver. The cost of ploughing an acre, including interest and depreciation charges comes to Rs. 9-13-1. The actual charges are collected at six rupees per acre and the total amount that was remitted into the Treasury is Rs. 2,157, while Rs. 208-13-6 are yet to be recovered. The arrangements of finding out people as well as of collecting the dues was entrusted to the President, District Local Board, West-Khandesh and he has given all possible help, which must be acknowledged here.

70. The cultivators, in whose fields the Tractor has worked, are of opinion that "the ploughing by Tractor is very beneficial to them as it removes the deep-rooted grass, like *Kunda Hariali*, etc., from the fields and can plough deeper than their local plough. How far it will have effect on the crops cannot be stated at this stage."

71. The cultivators in this District have now taken a strong liking for the Tractor and the President is receiving demands for Tractor ploughing for the next season from now.

72. Following items of interest can be enumerated as a result of the propaganda work if it is to be judged from that point of view.

In spite of the peculiar season ploughs Motes and Rahats were in demand. The demand and purchase of concentrated manures for sugar-cane, onions, garlic and cotton is on the increase. Insecticides were used on a large scale to treat mites and thrifts on chillies and onions. Besides this, Sulphur dusting as a preventive against grape vine mildew was successfully demonstrated and a demand for its use has been increased. Many people will use it as is seen from the inquiries we are getting here.

73. N. R. Cotton and Dhulia 1 has gained confidence of the cultivators and there is a great demand for seed both in and out of the Division.

74. Akola Bajri and Pusa wheats have become popular and the demand for their seeds is on increase.

75. Area under Spanish Peanut is increasing in Nasik District. S.48 variety of sugar-cane has become popular and the area under this variety is increasing.

76. In general we have gained the confidence of people and they come to us for help and advice freely.

77. *Work in Dangs.*—The special Kamgar appointed for the tract worked on the lines stated in the last year's Report which is supervised by the Diwan of Dangs.

The cultivators have appreciated the value of putting bunds for rice fields and they are putting bunds of their own accord. The superior Nagli strain is popular and the area is increasing. People also have taken to storing grass and preservation of grass in silo was demonstrated. People have taken to use Meston plough for rice cultivation. Improvement of poultry has been taken up and half a dozen of cocks have been distributed amongst the people by the Forest Officers. Attacks from rats were successfully treated by using poison and more than 450 rats were killed and crops were saved.

78. The bad climate allowance recommended last year has not been sanctioned and it is expected that it will soon be sanctioned.

79. *Mechanical Assistant.*—The Mechanical Assistant was on leave for two months during the year under report and his post was vacant. He completed one erection work namely,

(1) Erection of 12 B.H.P. Blackstone Crude Oil Engine on Jalgaon Farm, and attended the repairs of Boring plants as well as of Power Chaff-cutting plant. Completed two site surveys and arranged for setting and repairs of grass mower and gins on Jalgaon Farm.

80. *Boring work.*—Mr. Moghe, Superintendent, Jalgaon Farm, supervised the work for two months and then Mr. Ghorpade, who acted for him as Superintendent, managed the work of this Section in addition to his own duties satisfactorily. Mr. Agashe returned from leave and was entrusted with the work of Boring Assistant. Owing to his ill-health he was again on leave and the post was vacant.

81. During the year under report the Agricultural Engineer inspected all the three machines and has given suggestions for repairs of these machines. Machine No. 11, accordingly, was put under repairs and is still under repairs as some of the parts of the Engine are not available here and have been ordered from the Makers. Other two have been set right and are working in East and West Khandesh. The third, which is under repairs, is idle for the last six months. The work done during the year was better than last year as will be seen from the statement. The total of footage bored this year was 1,405 feet against 1,289 feet in last year. This footage is of two machines since the third was

idle for six months. In all 19 bores were taken and out of these 13 are successful, 4 unsuccessful and 2 have been abandoned. The majority of idle days were on account of machanical troubles, or breakage of parts of machine, which could not be replaced being not available with agents or makers also. The delay is unavoidable under the present arrangements as reported in the last year's report.

82. The statement of particulars of bore made in the North Central Division from the 1st July 1927 to 24th June 1928 together with cost of bores, etc., is enclosed, as Appendix A.

83. *Education.*—There was no change in the working of the Agricultural School, except that Carpentary classes are taken in the School Workshop instead of in Technical School, Dhulia. The total number of students undergoing the course was 30, 13 being in the second year and 17 in the first. Taken up by Districts, the number of students was:—

East Khandesh	10
West Khandesh	6
Nasik	14
	30
and by caste	
Marathas	14
Other backward classes	12
Brahmins	4
	30

84. The poultry work started last year is progressing well and is proving useful to give training to boys.

85. The long felt difficulty of training the boys in Oil Engine working was removed by the erection of new pumping plant and training in Oil Engine and pump working is given to the second year boys.

86. The cost of education, under report, was as detailed below:—

Details.	Amount.
	Rs.
Teaching Establishment	3,954
Capital expenditure (Purchase of Dead Stock, Live Stock, etc.)	268
Recurring charges—cultivation, upkeep of Live Stock, etc.	3,876
Maintenance of students	3,375
Total ..	11,473

Out of these Rs. 3,375 were collected by the Local Committee from several sources in the North Central Division, which was utilized defray the boarding expenses of the students.

87. Rs. 1,279 worth of Farm produce was sold and proceeds credited into Government Treasury.

88. The Annual Examination was held by Mr. R. Y. Hulkoti, B.Ag., Inspector of Agricultural Schools and Mr. S. K. Ghorpade, B.Ag., Graduate Assistant. Ten students have passed the final year and thirteen in the first year. Three of the first year, who have failed in one or two minor subjects were promoted. The Examiners have remarked that:—

"1st year.—The boys don't seem to have grasped the principles underlying the different agricultural operations and are weak in the knowledge of adjustments of implements.

2nd year.—They are somewhat better than 1st year boys in their knowledge of agriculture, but are very weak in their knowledge of crops and implements. Though fairly well done in surveying more practice is necessary.

In general the boys have better grasping capacity, but the method of teaching Agriculture and Nature study needs radical change."

89. There are eleven Agricultural Bias Classes in this Division and necessary advice, on cropping, managing the plots as well as on field instructions, is given by the District staff.

The schools are at—

(1) Ozar.
(2) Dabhadi.
(3) Sukene.
(4) Nampur, in Nasik District.
(5) Asode.
(6) Waghali.
(7) Thorgavan.
(8) Bhalod, in East Khandesh.
(9) Kusumbe.
(10) Shirpur, in West Khandesh.
(11) Jamner, in East Khandesh.

90. It has been observed that there are great many difficulties in working of these classes, as well as there is no uniformity in the working of these Schools and unless these are removed there will be no progress. The main difficulties are:—

(1) The funds are not supplied in time.
(2) Cordial help in teaching is not given.
(3) Head Masters put unnecessary difficulties in arranging the work or giving assistance.
(4) The course is misrepresented by the staff.

91. Mr. N. V. Bhagwat, who was entrusted with Cotton Finance Enquiry Work, has done it very carefully and tactfully. Mr. Ghorpade has shown his ability as Manager of a big Farm and Mr. Moghe as Supervising Officer.

92. The sympathy and co-operation shown by the Officers of other Departments continued and is acknowledged before closing the report.

K. M. PAWAR,
Deputy Director of Agriculture,
N. C. D., Nasik.

Nasik, 18th July 1928.

APPENDIX

Statement of Boring,

Serial No.	Name of well owner	Name of Taluka	Name of village	Diameter of boring	Depth of boring	Water before boring in gallons, per hour
	Boring Machine No. 24—					
1	Mr. P. N. Khunte	Nandurbar	Ranala	3"	30'-0"	One Moto was not working for two hours.
2	Mr. B. K. Bharucha	Amalner	Khurla Budruk	3"	174'-0"	Not known.
3	Mr. Bhila Dalpat	Do.	Palasdade	3"	50'-0"	Do.
4	Mr. Lakha Dula	Do.	Dahiwad	3"	50'-0"	Do.
	Boring Machine No. 11—					
1	The Principal, St. Barnabas School.	Chandwad	Manmad	3"	177'-6"	Surface Bore
2	The Principal, St. Barnabas School.	Do.	Do.	3"	50'-0"	Do.
	Boring Machine No. 19—					
1	Mr. Nana Motiram Patil	Raver	Balwadi	3"	72' 0"	Not sufficient for pumping work.
2	Do.	Do.	Do.	3"	44'-0"	
3	Do.	Do.	Do.	3"	53'-0"	
4	T. T. Chaudhari	Yawal	Bhalod	3"	93'-0"	Not known
5	Do.	Do.	Do.	3"	95'-0"	Do.
6	Ramji Shenu	Raver	Balwadi	3"	112'-0"	Do.
7	Khushal Shivram	Do.	Do.	3"	58'-0"	Do.

A.

1927-28 (in N.C.D.).

Water after boring in gallons, per hour	Departmental charges	Labour charges and kerosine for piping	Total cost	Cost per foot	Result	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
Two Motes are working for whole day.	50 0 0	197 12 0	247 12 0	3 4 2	Successful.	
....	....	939 0 0	939 0 0	5 6 4	Unsuccessful.	Not charged as per Government Resolution, Revenue Department, No. 7075 of 5th May 1925.
	58 8 0	79 [illegible] 0	137 [illegible] 0	2 12 0	Do.	Work stopped by owner and hence charge for successful bore as per Government Resolution.
....	57 [illegible] 0	95 10 0	152 14 0	3 0 11	Do.	Work stopped by owner and hence charge for successful bore as per Government Resolution.
....	....	497 0 0	589 0 0	2 9 5	Do.	Not charged, as per Government Resolution, Revenue Department, No. 7075 of 5th May 1925.
240 gallons per hour..	92 0 0				Successful.	
Sufficient for working pump.	83 0 0	72 13 0	155 13 0	2 2 8	Successful.	
Sufficient for working pump.	44 0 0	49 2 0	93 2 0	2 1 10	Do.	
Sufficient for working pump.	66 8 0	41 6 0	107 14 0	2 0 2	Do.	
Sufficient for working 2 Motes.	247 0 0	114 0 0	361 0 0	1 14 9	Do.	
Sufficient for working 2 Motes.	155 0 0	47 12 0	202 12 0	1 12 9	Do.	
Sufficient for working 2 Motes.	80 0 0	..	80 0 0	1 6 1	Do.	Labour charges not known.

APPENDIX

Serial No.	Name of well owner	Name of Taluka	Name of village	Diameter of boring	Depth of boring	Water before boring in gallons, per hour
8	Hiraji Totaram	Raver	Balwadi	3"	83'-0"	Not known.
9	Do. 2nd	Do.	Do.	3"	42'-0"	Do.
10	Do. 3rd	Do.	Do.	3"	47'-0"	Do.
11	Onkar Keshav	Do.	Do.	3"	62'-0"	Do.
12	Kisan Udesing	Do.	Do.	3"	54'-0"	Do.
13	Dhana Sadu	Do.	Do.	3"	40'-0"	Do.

A—contd.

Water after boring in gallons, per hour	Departmental charges	Labour charges and kerosine for piping	Total cost	Cost per foot	Result	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
Sufficient for working 2 Motes.						
Sufficient for working 2 Motes.	209 8 0	475 0 0	684 8 0	3 15 8	Successful.	
Sufficient for working 2 Motes.						
Sufficient for working 2 Motes.	71 0 0	60 0 0	131 0 0	2 1 10	Do.	
		193 8 0	193 8 0	3 9 4	Unsuccessful.	Work stopped by Department and hence not charged.
		197 0 0	197 0 0	4 14 10	Unsuccessful.	Work stopped by Department and hence not charged.

APPENDIX D.

Summary of the work done under the Deputy Director of Agriculture, South Central Division, Poona, for the year 1927-1928.

Staff.

(1) I remained in charge of the Division throughout the year. I was away in January-February 1928 to United Provinces and Bhopal for 3 weeks with Mr. V. G. Patwardhan, M.Ag., M.Sc., Assistant Professor of Chemistry, to study Sugar-making as village Industry.

(2) There were very few changes in the staff this year.

Mr. H. C. Patil, who was on deputation as Lecturer in Agriculture at the Poona Agricultural College, reverted to this Division in September 1927 and was posted to work as District Agricultural Overseer, Poona. Mr. B. N. Bhandarkar, District Agricultural Overseer, Poona, was transferred to Baramati as District Agricultural Overseer, Nira Left Bank Canal; and Mr. S. B. Jadhav was posted as District Agricultural Overseer with Head-quarters at Malsiras for propaganda work on the Nira Right Bank Canal.

Lines of Work.

(3) The operations of this Division are summarised under the same following heads as it was done last year to facilitate references and comparisons where needed :—

(I) Research

(II) Propaganda

(III) Agricultural Organizations :—

(A) Taluka Development Associations and

(B) Non-credit Co-operative Societies.

(IV) Agricultural Services :—

(A) Boring Operations.

(B) Engineering advice and assistance.

(C) Pig killing operations.

(D) Field Embankments.

(V) Agricultural Education.

(VI) Departmental Administration.

Section I.

Research.

(4) The season on the whole was good for Sugar-cane crop in the Deccan.

(5) *Manjri Farm.*—The line of experiments conducted on this Farm has been given in the Annual Report of 1925-26 and the experiments which are showing interesting results have been summarised below and those that have been conclusive have been deleted:—

(6) *Quantity of Nitrogen required to produce a heavy crop.*—A full description of this experiment is given in 1926-27 Annual Report. This is the 5th year of the experiment. Out of 5 years, the results of one year, *i.e.*, 1923-24 have been vitiated owing to shortage of water supply. The four years' results of yield have revealed the following:—

(*i*) In the year when conditions are optimum for crop growth of Cane the yield has been found to increase proportionately with the increased quantities of Nitrogenous top-dressing doses. But there is very little proportionate increase between 225 lbs. N. dose and 300 lbs. N. dose when the conditions are not optimum for crop growth of Cane; the proportionate increase is found up to 150 lbs. N. dose and beyond this, additional doses have given low yields than 150 lbs. N. dose.

(*ii*) From the economic point of view, *i.e.*, considering profits after deducting extra cost of additional manures, 150 lbs. N. dose of top-dressing has been found to produce an economical crop.

Since the question of optimum conditions for the crop growth of Cane has come in, the results will be watched in future years to verify the findings.

(7) *Efficient and Economic Substitute for Farm Yard Manure or Cake, i.e., Sann Green Manuring.*—This experiment has been reported in last year's report, paragraph 2 of section I. The results of the 4th year are available and they corroborate the statement made last year.

(8) *Suitable Crops for Rotation with Sugar-cane.*—The cycle of rotation has not been complete and hence conclusions will only be drawn when the cycle is complete. However, some of the crops such as Cotton and Tobacco have been found to yield well. The maximum yields of Cotton and Tobacco were 1,465 lbs. seed Cotton and 1,132 lbs. cured Tobacco per acre.

(9) *Quantity of Irrigation water and Interval between two consecutive waterings.*—Full description of these experiments has been given in 1924-25 Annual Report, paragraph 5. It is now 5 years since the experiments are conducted and the results are available.

(*a*) *Quantity of Irrigation Water.*—In this experiment 75, 100 and 125 acre-inches are given to Sugar-cane crop. The results for the past five years show that besides the water supply the following factor influences the yield:—

"Effective rainy days during growing period."

In the first two years, *i.e.*, 1923-24 and 1924-25 when the number of effective rainy days was small, the yields have been heavier with 100 and 125 acre-inches of water, *i.e.*, more quantity of water. But in the latter 3 years the yields have been heavier with 75 acre-inches of water than

100 and 125 acre-inches. The definition of an effective rainy-day is as under :—

"Any day with more than 10 cents or any day with even less than 5 cents if in association with similar or wetter days with cloudy weather."

The following statements of yield and effective rainy-days data will corroborate the statements made above :—

Treatment	Yield of Gul per acre in lbs.				
	1923-24	1924-25	1925-26	1926-27	1927-28
75 Acre Inches	6,003	7,986	9,190	11,917	10,831
100 Acre Inches ..	7,528	8,960	8,797	10,385	10,038
125 Acre Inches.. ..	8,850	9,271	7,696	10,088	8,422
Rain-fall (in inches) ..	13·4	25·9	15·04	19·67	24·94
Number of effective rainy days.	47	66	78	80	93

(*b*) *Interval Series.*—In this experiment, 10 days' interval of watering is compared with 8 and 15 days. But the quantity of water given has been the same in all 3 cases *i.e.*, 75 acre-inches in addition to usual rainfall in the year. The average yield for the past 5 years is tabulated and it shows that 8 days' period is the best ; it has given superior yields to 10 and 15 days' interval.

Treatment	Average yield per acre		Quantity of water actually given Average of 5 years in acre-inches exclusive of rainfall
	Cane weight in lbs.	Gul weight in lbs.	
8 days	75,532	10,123	82·10
10 days	70,805	9,092	82·37
15 days	69,801	8,819	83·00

(10) *Selection of profitable varieties.*—Five varieties, HM544 (Baramati), D109, Manjav, Waxy Red and HM600 were tried in comparison with Pundia on a large scale for the last five years, except HM544, which has been tried only this year. Amongst the results obtained of the varieties tried for 5 years, D109 has topped the list recording on an average 9,149 lbs. Gul yield per acre against 8,729 lbs. Gul yield of Pundia.

The yield of HM544 (Baramati) in the year under report even though not superior to Pundia, yet has equally good yield, which can be seen from the following statement :—

Name of variety	Weight of Cane per acre in lbs.	Weight of Gul per acre in lbs.	Brix	Extraction per cent.	Percentage of Gul to Cane
(1) HM544 (Baramati) ..	1,02,500	11,575	16·8	73	11·29
(2) Pundia	80,874	11,905	19·4	78·7	14·7

HM544 is reported to be a late variety requiring 1 to 1½ months more than that of Pundia.

(11) *Botanical study in the field and chemical control of Gurhal operations.*—The work in this direction is being continued.

(12) *Sugar-making.*—Khan Bahadur S. M. Hadi, Director of Agriculture, Bhopal, has made several improvements in the Industry of Sugar-making as a village industry and these improvements have been found to give a high recovery of sugar on cane and consequently more profits. The process consists of :—

(1) Boiling the Sugar-cane juice for preparation of 1st rab. (Appliance—Improved Furnace with 6 pans).

(2) Machining the 1st rab for manufacture of 1st sugar. (Appliance—Centrifugal Machine).

(3) Boiling the Molasses from 1st rab for preparation of 2nd rab. (Appliance—Improved Furnace with 3 pans).

(4) Machining 2nd rab for manufacture of 2nd sugar (Appliance—same as under 2 above).

(5) Drying and Bleaching Sugar. (Appliance—Wooden Roller with a Wooden Plate).

The results at Bhopal encouraged the undertaking of this experiment at the Manjri Farm with two objects :—(1) to study recovery of Sugar-making with Pundia Cane in Deccan conditions and (2) to see how this industry can pay more to Cane growers in the present crisis of the depression of Gul.

As regards recovery of Sugar the following statement will give the actual recovery of Sugar on Cane (Pundia):—

Name of variety	Plant or Ratoon	Sugar and Molasses obtained on Cane			Total sugar	Total recovery per cent on Cane	Sugar recovery on juice
		1st sugar	2nd sugar	Molasses			
1	2	3	4	5	6	7	8
(1) Pundia (whole cane).	Plant ..	5·75	2·08	4·65	7·83	7·83	11·34
(2) Pundia (top-sets removed).	Plant ..	6·81	2·52	5·5	9·33	9·33	12·13

Note.—The above figures are calculated as an average result of three trials in each case.

Whilst conducting the experiment it was found that preparation of 2nd sugar is a tedious process for Deccan cultivator and hence the 1st Molasses were turned into Molassein Gul instead of 2nd Rab. The following statement will show the production from one acre Cane of (1) Sugar alone, (2) Sugar and Mollassein Gul and (3) Gul alone :—

Description of Tests	Quantity obtained from 800 Maunds of Cane				
	1st sugar	2nd sugar	Molasses	Molassein Gul.	Gul alone
	Maunds	Maunds	Maunds	Maunds	Maunds
(1) Tests in which 1st and 2nd sugar alone was made (whole canes)	46·00	16·64	37·2	..	..
(2) Tests in which 1st sugar and Molassein Gul was made (whole canes).	46·00	..	..	59·74	..
(3) Tests in which Gul alone was made from Canes.	..	..	..	..	101·6

Note.—In all sugar weights the weights have been taken fresh when it was taken out of Centrifugal Machine.

The experiments of this year show that if 1st Sugar and Molassein Gul are prepared it leaves about Rs. 90 to Rs. 100 profit more, per acre, than Gul-making alone. These results have been corroborated by similar experiments conducted by Nira Left Bank Canal Agricultural Development Association, Baramati. Further trials, however, seem necessary to corroborate the data.

(13) *Visitors.*—The Farm was visited by the Honourable Mr. G. B. Pradhan, Minister for Agriculture, Excise and Forest, and the Honourable Mr. A. R. Mudaliyar, Minister for Development, Madras.

(14) *Profit and Loss.*—The following statement will reveal the cost of cultivation, value of produce, profits and yields per acre for 4 years as per standard method of Manjri Farm (cost per unit of labour equal to 11 annas) :—

Year	Cost of cultivation	Value of produce	Profit per acre	Average yield of Gul per acre in lbs.	Rate of Gul in lbs.
	Rs. a. p.	Rs. a. p.	Rs. a. p.		
1924-25	660 10 6	1,118 6 0	457 11 6	8,947	8
1925-26	635 9 0	926 6 0	290 13 0	9,264	10
1926-27	623 13 0	903 13 0	279 15 7	9,942	11
1927-28	626 8 0	829 2 8	202 10 8	9,950	12

(15) *Baramati Farm.*—The experiments conducted on Manjri Farm and which proved conclusive were tried for confirmation on this Farm

with the necessary modifications to suit the local conditions. The cycle of several of these experiments has not been complete and hence only those which are showing comparative data are summarised.

(16) *Nitrogenous Top-dressing Experiments.*—Nitrogenous top-dressing doses in different quantities to Cane-crop such as 150 lbs., 200 lbs., 250 lbs. and 300 lbs. Nitrogen were tried and results have shown that 150 lbs. Nitrogen dose of top-dressing has given an economic yield and the proportionate increased doses of Nitrogen have not shown proportionate increase in yields, as well in profits, in comparison with 150 lbs. Nitrogen dose.

(17) *Varietal Trial.*—Five cane varieties, Java, Stripped Mauritius, B1528, HM544 and D109 were under trial. Amongst these, the three varieties HM544, D109 and Java show the better yielding capacity.

(18) *Average yield of Canes on the Farm.*—On this Farm the average yields of Cane were comparatively better in past years and in 1925-26 the yield of Gul was at its maximum, *i.e.*, 14,383 lbs. of Gul per acre. But the area is getting water-logged owing to its situation and the yields of Gul are going down. The average yield of Gul per acre in the year was only lbs. 7,429 against lbs. 10,522 in 1926-27 and 10,898 lbs. average of past 7 years.

(19) *Kopergaon Farm.*—The average yield of Gul per acre during the year was 11,363 lbs. of Plant Cane and 10,172 lbs. of Ratoon Cane. Amongst the varieties of Cane, D109 and HM544 have shown better yields of both, Plant and Ratoon. It was found that HM544 produces nearly the same tonnage as Plant Cane when as Ratoon.

As regards other experiments the cycle is not yet complete.

(20) *Mohol Plot.*—As reported in last year's report the chief crops grown are Cotton and Jowar Rabi. The season was unfavourable for Cotton, but good for Jowar. The average yield obtained of Cotton and Jowar were 147 lbs. seed Cotton per acre and 413 lbs. Jowar grain and 701 lbs. Kirbi.

(21) *Graded* vs. *Ungraded Seed.*—As reported in last year's report a plot was arranged to see the effect of graded *vs.* non-graded and the yields are tabulated below :—

Serial No.	Treatment	Number of plants per acre at harvest	Yields per acre	
			Grain lbs.	Fodder lbs.
1	Seed graded with sieves	26,080	760	1,320
2	Ungraded	20,560	500	1,080

This year again nearly 52 per cent. increase has been visible. Special propaganda done in this connection in this District is reported separately.

(22) *Evil Effects of Surface Washings, i.e., Soil Erosion.*—The advantages of putting a Tal are no doubt realised by all but the effects

of surface washing in reducing the yield are not realised unless the yields are separately recorded. With a view to know how this affects an average yield of a plot, since last year, several tests were taken at places in the plot where the soil was washed away and where it was not. The following statement of yields recorded will show the comparison :—

Year	Average yield in lbs. in washed lands		Average yield in lbs. in unwashed land		Average yield in lbs. of plot with washed and unwashed area	
	Grain	Kadbi	Grain	Kadbi	Grain	Kadbi
1926-27 ..	197	475	967	1,320	516	780
1927-28 ..	173	483	611	1,226	413	701

The results will just reveal how heavy the losses are and these will vary with the proportionate area washed in each survey number.

Section II.

Propaganda.

(23) The principal items of programme of the District Staff are as under :—

(24) *The Popularization of the Copper Sulphate treatment of Jowar against Smut.*—Intensive propaganda for distributing Copper Sulphate packets by means of demonstrations and lectures, etc., was done with the help of Revenue and Irrigation Officers and the number distributed for each District was as under :—

Name of District	No. of packets distributed in 1927-28
(1) Ahmednagar	4,464
(2) Sholapur	3,308
(3) Satara	1,240
(4) Poona	967
(5) Canal Area (including Nira Right Bank) ..	6,912
	16,891

The distribution of packets this year was more than what it was last year. This depends upon the virulence of the disease.

(25) *Introduction of New Crops and Varieties.*—(*a*) *Introduction of Sugar-cane Varieties in the Canal Tract.*—In the last year's report it was stated that the sets of two varieties, HM544 and D109, were distributed. Amongst these, D109 is being distributed since four years and it has kept still a good record of yield. On Pravara Canal, D109 has yielded 12,500 lbs. of Gul against 10,400 lbs. of Pundia. HM544 had its Ist trial from the point of recording Gul-yield on Godavari and Pravara Canals. This variety has shown on Nira Left Bank superiority in yield over that of Pundia and it is found as most suitable for soils which are sick with

Pundia, having other special characters of its own. There were several comparative plots on all the three Canals of this variety and it has been found from this year's results obtained that on Godavari and Nira Left Bank Canals the yields of HM544 are superior to Pundia. But on Pravara Canal, where the soil is new to Cane, it has not shown any superiority but has yielded equally well like Pundia. On Godavari Canal the average yield of HM544 (Plant Cane) was 9,779 lbs. Gul against 9,353 lbs. Gul of Pundia and the yield of Ratoon Cane recorded 12,320 lbs. Gul per acre against 11,462 lbs. Gul of Pundia. On the Nira Left Bank this variety has again recorded a high yield of 12,520 lbs. of Gul *vs.* 12,080 lbs. Gul of Pundia. The observations made above with regard to HM544 on different Canals, both as Plant and Ratoon, will be watched very carefully in future years. During the year on Godavari and Pravara the sets were given at concessional rates. On Nira Left Bank the variety is spreading of its own accord. The following statement will give the comparative area under the varieties for the last 2 years and the sets distributed in 1927-28 :—

Name of Canal	Name of variety	Area planted in 1927-1928	No. of sets distributed in 1927-1928	Standing area planted in 1928-29
		A. g.		A. g.
(1) Nira Left Bank Canal ..	HM544	150 0	*Nil.*	200 0
(2) Nira Right Bank Canal ..	HM544	*Nil.*	12,500	1 20
(3) Pravara Canal ..	HM544	4 0	25,832	8 0
(4) Pravara Canal ..	D109	2 20	75,000	12 0
(5) Godavari Canal ..	HM544	9 10	107,700	25 0
(6) Godavari Canal ..	D109	2 0	....	3 0

(*b*) *Introduction of N.R. Cotton in Canal Area and Nagar and Sholapur Districts—Canal Area.*—Cotton crop growing is finding in favour with Cane-growers owing to 2 main reasons : (1) It is found to leave profits and (2) the money is available from this crop, when it is badly required for the harvest of Sugarcane crop. The year was not a very good year for the Cotton crop. September rains did a lot of injury and consequently reduced the yield. But the price of Cotton compensated for the low yield. This year the price ranged between 75 to 85 Rupees against Rs. 45 to Rs. 55 of last year per Candy of 500 lbs. seed-cotton. The yields obtained in two years, maximum and average, on the three Canals have been tabulated below :—

Name of Canal	Yield of seed-Cotton in lbs. per acre in 1926-27		Yield of seed-Cotton in lbs. per acre in 1927-28	
	Maximum	Average	Maximum	Average
(1) Nira Left Bank Canal ..	1,905	1,168	2,275	860
(2) Pravara Canals ..	1,065	627	1,028	685
(3) Godavari Canals ..	1,075	1,012	1,082	788

This year water was made available in May on all the three Canals and the approximate area sown is as under :—

Name of Canal	Approximate area sown under Cotton in 1928.
(1) Nira Left Bank Canal	7,000
(2) Pravara Canals	4,000
(3) Godavari Canals	3,000

Three cultivators, who were supplied with 1500 lbs. N.R. Seed last year produced a crop which was separately ginned under Departmental supervision and the quantity available for distribution was 50,000 lbs. This whole quantity was distributed and the demand being very great local merchants imported seed and distributed at a very high rate. The above seed was distributed on 4 Canals as under :—

	lbs.
(1) Nira Left Bank Canal	25,500
(2) Nira Right Bank Canal	6,000
(3) Pravara Canals	8,500
(4) Godavari Canals	10,000

During the year 500 lbs. of fresh N.R. Seed was ordered from Jalgaon Farm and this has been distributed to three cultivators.

Nagar and Sholapur Districts.—In Nagar District the importance of N.R.Cotton over the local mixture is being realised and hence 10,000 lbs. N.R.Seed was imported and distributed.

In Sholapur District the Kharif Area under Cotton varies greatly according to distribution of rains in Kharif season, but the area under well irrigation is constant. The total quantity of N.R.Seed distributed was 7016 lbs.

(26) *Introduction of Groundnut Varieties.*—The following statement shows the distribution of different varieties of Groundnut seed during the year :—

Name of variety	Quantity distributed in each district				
	Poona	Satara	Nagar	Sholapur	Canal Area
Japan Big	1,478	..	..	2,709	3,480
Pondicherry	..	2,366	..	..	..
Small Japan	..	2,000	..	..	3,000
Spanish Peanut ..	1,000	..	1,000	480	8,540

On the Canals, Spanish Peanut is rapidly spreading with N.R.Cotton under irrigation and in Newasa and Shevgaon Talukas of Nagar District and in Junnar Taluka of Poona, the area is increasing under this variety.

(27) *Introduction and dissemination of Akola Bajri.*—The importance of Akola Bajri is well realised by the cultivators in all the districts owing to the high yield and hence this year fresh seed, 6752 lbs. of Akola Bajri was exported from Nagar to different parts.

(28) *Introduction of New-crops like Pusa-4 Wheat, Potatoes and Ginger crops on Canal Area*—(*a*) *Pusa-4 Wheat.*—The variety is extending on all the three canals. This year owing to abnormal weather in winter the yields were comparatively low ; but it is liked for its rust resistance and the area is expected to have gone more than 700 acres on all the canals.

(*b*) *Potatoes.*—This crop is showing signs of establishing on the Nira Canal. In the Kharif season yields, 6 to 8 times the seed, were obtained and in Rabi season, 10 to 12 times the seed. In Rabi season 9,000 lbs. fresh Italian Seed was brought and distributed on the Nira Canal. The irrigation department has made arrangements to appoint a man, expert in Potato-growing, to advise the cultivators and show the methods and thus encouraged the Nira Left Bank Canal cultivators to grow Potatoes.

(*c*) *Ginger.*—This year the crop has improved in yield and the yields obtained varied from 8,000 lbs. to 11,000 lbs. per acre green Ginger as against 1,280 lbs. of last year. Rs. 700 worth of Ginger seed has been distributed on Canal.

(*d*) *Tobacco.*—To introduce a Tobacco crop special lectures were arranged of Mr. D. H. Tagare, Inspector of Agriculture, Sholapur, who has experience of Tobacco-growing at several places, on the canal and as a sequence to that, nearly 100 acres under Tobacco were grown on Canal. The two varieties tried were Nipani and Gujrathi which yielded 1,500 and 1,200 lbs. cured Tobacco per acre. This year 20 lbs. of seed has been distributed and a special man, expert in Tobacco-growing and curing, is indented to give instructions to cultivators.

(29) *Introduction of Improved Methods in Sugar-cane Growing (Canal Area), Java Method and Cotton Cultivation.*—(*a*) *Sugar-cane Growing :*—(*i*) *Wide method of Planting Cane and* (*ii*) *Reduction of sets.*—The propaganda is being continued by having demonstration plots in cultivators' fields and the advantages have been realised by the Cane-growers who are adopting in their own fields 3½′ to 4′ width in planting and 10 to 12 thousand sets per acre according to suitability of their soils and other environments.

(*iii*) *Trial of new manures.*—Calcium Cyanamide and Amophos manures were tried to Cane as a top-dressing in comparison with the Ammonium Sulphate ; and the results have shown that these manures give equally good results as Ammonium Sulphate.

(*b*) *Java Method of Planting Cane.*—The area under Cane with Java method of planting during the year on different Canals was as under :—

Name of Canal	Area in acres of		
	Ratoon	Plant	Total
(1) Godavari Canals	30	8	38
(2) Pravara Canals	6	2	8
(3) Nira Left Bank Canal	....	5	5

During the year the method is modified. The trenches for planting Cane are made by country plow instead of by hand-digging in order to reduce the heavy cost of cultivation. The outer drains and inner drains are only dug by hand and the inner drains are at a distance of 100′ instead of 33′ in old system. The cost of these operations has been brought down from Rs. 120 to Rs. 50.

(c) *Cotton.*—Cotton has been introduced as a rotation after Sugarcane as it is a better monetary crop in the Block Areas and also as one of the staple crop in 8 months blocks. In the Block Area soon after Sugarcane is harvested, there is very little time left to prepare the land for Cotton and sow Cotton in time, *i.e.*, before 15th May; besides the operations are found to be costly and hence comparative trials were made with (*i*) sowing on ridges and (*ii*) sowing in flat after the preparation of the land. The yields recorded of several plots on all three canals have not shown any increase in flat method and hence this point requires further study.

(30) *Spraying and Fumigation operations.*—The Potato growers of Khed Taluka have realised the use of spraying and dusting of Potatoes against Tambera disease. This year the intensity of Tambera disease was not very severe. However 30 acres and 30 gunthas of Potatoes were treated with Sulpher Dust by the Taluka Development Association, Khed.

(31) *Grass-Hopper Campaign.*—In the Satara District, the pest was severe in Tasgaon, etc., Talukas. The campaign was started in August and finished in December by appointment of a special man. The method of catching was demonstrated and as a sequence Taluka Development Association and Credit Societies have arranged to help the cultivators by supplying bags.

(32) *Horticultural Operations.*—On Canals the area under fruit trees is increasing. The area under Grapes on Nira Right Bank has increased to 45 acres. Chikoos and Figs, introduced newly, have been found to be progressing well. Recently budded Lemons are being introduced.

In Satara District a special class was organised for a week to teach all Horticultural operations with the help of the Horticulturist to the Government of Bombay. The class had 90 students. At the end of the class an examination was held in which 50 students passed. The class was very much appreciated.

(33) *Implement Depots.*—The total hire received from Implement Depots amounted to Rs. 903-13-9. As reported in last year's work the work has been transferred to the Taluka Development Associations and it is found that private gentlemen have taken to hiring of implements.

(34) *Use of Poudrette.*—As per recommendation (L) in Mr. Jenkin's note attached to Government Resolution, General Department, No. 4290, dated the 7th August 1924, a special grant was allotted for this Division amounting to Rs. 970 for making a propaganda for (*a*) the preparation of Poudrette as per Nasik system through Sanitary Bodies or Municipal

Bodies and (*b*) to demonstrate the use of manure to different irrigated crops in the Division. The grant was distributed as under :—

(*a*) Rs. 720 To Alandi Municipality.

(*b*) „ 250 To the Divisional Superintendent of Agriculture and the Inspector of Agriculture, Sholapur.

(*a*) The Alandi Municipality has prepared the Poudrette and some quantity has been made available for demonstration which will be used for Potato and Onion Crops in Khed Taluka and round about Alandi.

(*b*) The Poudrette manure was purchased and used for Cotton and Wheat Crops on Canal and in Sholapur District. The crop after the use of Poudrette was superior and hence it was demonstrated. The average of several plots of Cotton has shown that plots treated with Poudrette have yielded 63 per cent. to 74 per cent. more yield over no manure and 16 per cent. more yield over F.Y. manure plot. In the case of Wheat Poudrette has yielded 50 per cent. more yield over that of no manure plot.

(1) Leaflet No. 17 of 1927.
(2) Leaflet No. 2 of 1928.
(3) Leaflet No. 3 of 1928.

The marginally-noted three leaflets on Poudrette manure and its use to Sugarcane, Cotton and Jowar have been drafted and published.

Sir Sassoon David Grant.—A sum of Rs. 1,500 has been allotted to this Division for conducting manurial experiments on Cotton and a scheme has been outlined both for Canal Area and Sholapur District.

(35) *Shows and Demonstrations.*—The Agricultural Propaganda is conducted through the following methods :—

(1) Organised Shows, (2) Demonstrations of Implements, Manures, New Varieties of crops, steeping and spraying as a means to prevent diseases of crops, (3) Jamabandi demonstrations and (4) organisation of depots, Implements, Manures and Seed Societies and Societies for purchase and sale of cultivators' produce.

Organised Shows.—As per circular issued in February 1927 by Mr. Main, a District Show was organised at Ahmednagar by a Managing Committee with Collector as the President of the Show Committee. A sum of Rs. 12,949 was collected from the District. The Agricultural Department organised the following sections as per model of the Presidency Agricultural Show :—

(1) Crops Court, (2) Land Development Court, (3) Implements Court, (4) Stall of Implements and exhibits of Crops, Fruits, Insects pests.

The Agricultural improvements suitable to Nagar District and those that have been introduced were actually shown through the lining of models and by means of demonstrations. An Industrial Section was also well organised with the Agricultural Show.

The Show was opened on 9th November by the Honourable Minister Mr. G. B. Pradhan and was about to be left open for seven days but after 3 days the heavy rains frustrated the attempts of the Committee and it had to be closed.

The Show was visited daily by 10,000 cultivators or more for whom concessions of Motor tickets were kept. This concession allowed cultivators to come and visit the Show.

There was a large collection about 10,000 exhibits of crops, cattle and horses and the Exhibits Committee spent a large amount in the form of

prizes of medals and cash. The prizes allotted for different sections were as noted below :—

Name of section	Total amount in the form of medals and cash
	Rs. a. p.
Cattle Section	557 0 0
Poultry Section	124 8 0
Field produce and Fruits	478 0 0
Subsidiary occupations including hand-weaving, etc. ..	585 12 0
Sports	462 0 0

A Stall of Improved Agricultural Produce, Exhibits and Implements.—With the Swadeshi Industrial Exhibition, Poona, and at the request of the Secretary of the said exhibition a stall showing all Bombay Department Improvements in Crops, etc., together with Implements was organised and demonstrated from 31st August to the end of September, *i.e.*, for a period of one month.

The number of persons who visited this show was about 30,000 and hence the stall was instructive and educative to all the types of persons concerned.

2, 3 and 4.—Demonstrations have been reported separately in the summary of work of each District while information in respect of (4) is given under the work of Non-Credit Societies mentioned in Section III of this report.

(36) *A Class of Irrigated Crops.*—Formerly instructions on Sugarcane cultivation were given by holding a class at Manjri Farm and as recently new crops have been introduced on Canal, such as Cotton, Tobacco, etc., where improved methods of cultivation of Sugarcane crop and other irrigated crops could better be studied and as well demonstrated in the actual best cultivators' fields, hence a class for nine days was arranged at Baramati. The arrangement of teaching was more of a practical nature whilst full information of the subject was supplied by means of lectures. The number of students by Districts was as shown in the margin; besides students, 6 officers of the Irrigation Department and 50 cultivators regularly attended the class. At the end of the period the candidates were examined and it was found that the instructions given were found to be very useful and of educative nature, and the candidates returned home full of information.

District	Number
(1) Poona ..	30
(2) Sholapur ..	5
(3) Satara ..	2
(4) Nagar ..	1
(5) Nasik ..	1
(6) Kolaba ..	1
(7) Akalkot State ..	2
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Summary of work done in each District and Canal Area.

(37) *Poona District.*—Several demonstration plots showing advantages of new crops, such as, Spanish Peanut, Akola Bajri, Kolamba Strains and Pusa-4 Wheat, were arranged in the District. Spanish Peanut has yielded in Saswad Taluka on an average, 1,706 lbs. pods and 1,545 lbs. fodder. Kolamba strain has been found to yield well over the local variety

by name Ambemohor, in all the three Talukas where it was tried in several plots. The average yields are as under in different talukas :—

Name of Taluka	Yield of Paddy in lbs. per acre of		
	Kolamba strain		Local
Mulsi	1,728	} *versus*	{ 1,600
Khed	2,990		{ 2,680
Junnar	2,610·6		{ 2,018

Akola Bajri has been giving 50 per cent. more yield over the local. Akola Bajri and Spanish Peanut are likely to spread in Saswad and Junnar Talukas. Pusa-4 Wheat has yielded 784 lbs. grain per acre against 415 lbs. grain of Baxi.

Eight Jamabandi meetings demonstrations, 4 crop demonstrations and 3 cinema film lectures were organised. Besides several steeping demonstrations were held. Help was rendered to two Agricultural Associations for framing programme, conducting demonstrations and two new Associations at Paud and Saswad are being organised.

(38) *Ahmednagar District.*—During the year a big District Agricultural Show was organised, which took most of the time of the staff of the District for management, execution, etc. To demonstrate the better methods of cultivation and advantages of new crops, suitable to Nagar District, actual crops were grown and these were shown to cultivators who visited the Show. The yields obtained in the plot were exceptional and hence the following tabular statement will show the crop yields under different treatment :—

Serial No.	Name of the crop	Object	Treatment	Yields per acre in pounds	
1	Ground-nut, Spanish Peanut.	New crop to be grown as dry crop.	Ordinary ..	1,680 lbs. pods	
	Jowar				
2	"A"—Graded and non-graded seed—			Grain	Fodder
	(*a*) Jowar (graded) ..	Advantage of grading of seed.	18″ drill ..	3,016	5,900
	(*b*) Jowar (non-graded)			1,408	3,420
	"B"—Wide method of sowing Jowar—				
	(*a*) Jowar ..	Advantage of wide sowing.	9″ drill ..	2,344	4,080
	(*b*) Jowar ..		18″ drill ..	3,304	5,700
	"C"—Dry farming method—				
	(*a*) Jowar (dry farming method).	Advantage of dry farming method	18″ drill (Bunds one foot tall were put). Five interculturings.	1,984	3,720
	(*b*) Jowar (local method).	....	9″ drill (one interculture).	768	2,100

Note.—The yields are high, (1) soil being Garden soil and (2) the favourable rainfall during the following period :—

	I. C.
September-November ..	7-6
October ..	1-26
November ..	3-97

However, the results are very interesting and better methods have shown superiority over local method.

Besides this show, several Jamabandi, crop and Implement demonstrations were organised. As usual demonstration plots showing advantages of new crops and manures were organised at different centres. Kolamba Strain No. 42 has yielded 1,000 lbs. per acre. N.R.Cotton has already shown superiority over local Cotton as reported in last year and Potatoes Rabi treated with Sodium Nitrate and Ammonium Sulphate have yielded as under :—

Potatoes with 250 lbs. $NaNO_3$ and 20 carts F.Y.M. and 250 lbs. Ammonium Sulphate with 20 carts F.Y.M. have yielded 10,460 and 10,200 lbs. against 8,000 lbs. with 40 carts of farm yard manure.

(39) *Satara District.*—During the year, 4 Agricultural and Cattle Shows, 6 Jamabandi Demonstrations and 6 small agricultural shows at the time of fairs were organised. Several plots of demonstrations were arranged of new crops such as Kolamba Strain, Potatoes, etc., and of artificial manure to crops like Chillies, Sugarcane and Betelvines, etc. 200 lbs. Super-Phosphate to Groundnut as manure has yielded 2,400 lbs. pods against 1,600 lbs. pods with no manure. The Ginger crop has yielded 10,000 lbs. fresh Ginger per acre and hence the demand for this seed has increased. The Betelvine crop was manured with 1,200 lbs. complete manure (640 lbs. Cake *plus* 336 lbs. Ammonium Sulphate *plus* 224 lbs. Safflower) in three doses at each earthing up, which has consequently yielded an average crop of 888,000 leaves against 600,000 leaves, *i.e.*, an increase by 35 per cent.

(40) *Sholapur District.*—During the year 10 Jamabandi Demonstrations, 17 crop and 14 Jowar seed grading and 10 interculturing Jowar crop demonstrations were organised. A special propaganda was carried on, during the year, of grading jowar seed in Sholapur District by appointment of a special Kamgar. In this District the quantity of Jowar seed graded during the year was 80,454 lbs. 79 plots were kept under observation at different centres of graded *versus* non-graded seed and the results were recorded. The average yield of all was as under :—

	Graded	Non-graded
	Lbs.	Lbs.
(*a*) Rabi Jowar ..	1,009½	737
(*b*) Irrigated Jowar ..	1,874	1,564

There has been decided increase in dry-crop by 36·9 per cent. over non-graded at an extra cost of Rs. 0-0-2 per acre. Besides the special propaganda several plots of new crops such as Pusa-4, etc., and Poudrette, Cake and Sodium Nitrate manure to Cotton were arranged. Pusa-4 as a dry-crop has yielded 571 lbs. grain and irrigated 955 lbs. on an average. The average yield under different treatments obtained of seed-cotton was as under :—

	Lbs.
Poudrette (15 cart loads per acre) ..	975
F.Y. Manure (15 cart loads per acre) ..	816
No manure	595

(41) *Canal Area.*—(This included Nira Left Bank, Nira Right Bank, Godawari and Pravara Canals).

On the four canals, 21 demonstrations were organised and the advantages of N.R.Cotton, Potatoes, Tobacco, Ginger, Grape cultivation, wide method of planting Cane, reduction of sets, HM544 as a new variety of Cane and manufacture of Sugar by Hadi process were shown to the cultivators. These demonstrations were largely attended by cultivators and the advantages are being realised by Cane-growers. Besides these, 86 demonstrations were arranged on Canal of steeping Jowar. In reduction of sets of Cane the yields obtained have been in favour with 8,000 sets per acre. The average yield per acre of Gul in 8,000 against 12,000 sets was 10,307 lbs. against 9,684 lbs. In the Java method of planting the maximum yield obtained is 10,520 lbs. of Gul and the average of several plots is 9,564 lbs. Gul per acre. Akola Bajri again has yielded on an average 937 lbs. against 825 lbs. of Local Bajri per acre. The yield of Jowar Crop with graded seed on Nira Right Bank has been found to be more than 20 to 30 per cent. over that of non-graded seed.

Section III.

Agricultural Organisations.

(42) "A"—*Taluka Development Associations.*—During the year three new Taluka Development Associations were registered only in the Satara District. In other Districts the number remained constant as was reported in last year's report. Thus the total number of all Associations registered, was 15.

The work reported in last year's report was continued, but some of the Associations did splendid work as was required by their special conditions. The following is a summary of the important items of work done by these Associations :—

Satara District—

(1) *Koregaon Association.*—A pig campaign was organised by the Taluka Development Association for which a contribution of Rs. 1,300 was collected from 40 villages and the same was conducted with the help of the Department. It has benefitted the villages as the area was increased under Potatoes and Groundnut in these villages.

(2) *Wai Association.*—8,840 lbs. of Potato Seed was purchased and distributed to cultivators and 400 grafted fruit trees were distributed.

Sholapur District—Madha Association.—The Association arranged to grade 44,000 lbs. Jowar Seed of cultivators through the Societies and did the work of supervising the Credit Societies.

Poona District—Nira Left Bank Canal Agricultural Development Association.—The Association arranged to stock the following seeds and distributed the same as under :—

		Lbs.
(1) N.R.Cotton Seed	..	11,825
(2) Groundnut (Spanish-peanut)	..	2,775
(3) Potatoes	..	8,800

Similarly the sub-branch at Gotandi which is mainly working an Implement Section, recovered hire of Rs. 90 during the year. The association undertook the work of sugar making and demonstrated the same.

Out of 15 Taluka Development Associations, 12 Associations worked and only three have not commenced their work as yet.

(43) "B"—*Non-Credit Societies.*—The following statement will show the work done in the year by the non-credit Societies which have been working. The rest of the non-credit Societies have not developed work as yet :—

Name of Society	Value of produce sold
"A" *Sale Societies*—	Rs. a. p.
(1) Haveli Taluka Agricultural Sale Society ..	2,54,113 0 0
(2) The Warna Valley Co-operative Sale Union, Ltd., Islampur	1,27,881 0 0
(3) Sholapur District Co-operative Sale Union, Kurduwadi	81,674 0 0
"B" *Manure Societies*—	Value of manure purchased and supplied
(1) Manjari Budruk Co-operative Manure Society..	12,533 0 0
(2) Hadapsar Co-operative Manure Society ..	9,545 0 0
"C" *Implement Societies*—	Hire recovered
(1) Shevgaon Co-operative Implement Society ..	127 0 0
(2) Pathardi Co-operative Implement Society ..	945 0 0
(3) Jamkhed Co-operative Implement Society ..	429 0 0
(4) Ruichatisi Co-operative Implement Society (unregistered)	200 0 0
(5) Tadwale Implement Society	97 12 0
(6) Shri Vithal Implement Society, Madha ..	180 0 0

(44) *Nangaon Co-operative Irrigation Society.*—This Society was registered in 1924 and the actual work commenced this year. The society has entered into a contract with the Agricultural Department and has promised to pay Rs. 8,000 for water supplied for 5,000 hours during the year. During the year, water was taken for 3,052 hours and this was distributed to Members and the area under different crops of Members stood as under :—

	A.	g.
Sugarcane	49	20
Lucerne	9	0
Eight months' crop	5	20
Kharif crops	48	20
Rabi crops	75	0
Miscellaneous	9	20

The area under irrigation would have increased but owing to sufficient and copious rain-fall, excellent harvest of Rabi crops was reaped which consequently prevented Members from growing more area under irrigation. The Department has arranged to spare a Graduate Assistant to help the Society and guide in its working.

Section IV.

Agricultural Services.

(45) The services under this head can be mentioned in the following form :—

Section IV-A.

(46) *Boring Operations.*—In the year under report 6 Boring Machines were working in Poona, Nagar and Sholapur districts. In addition to these six, F3 Calyx Machine worked round-about Poona. The total number of bores undertaken was 57 as against 48 of the last year. Out of 57, 27 were successful and the rest were unsuccessful. The percentage of successful bores was 51·9. The total footage bored was 5,150'-11" as against 3,414'-6". Each machine, except F3 Calyx, worked on an average, for 172 days in a year. F3 Calyx was only working for six months. There was a great demand for F3 Calyx machine but the machine had to be transferred to the Agricultural Engineer. The cultivators appreciated the machine over that of Musto Patent Power Boring.

The Boring Assistant, Mr. G. C. Govande, has done very satisfactory work in the year and has devised an arrangement for taking out the *sludge* from the bore. If this turns out successful there will be two benefits, *viz.*, that (1) there is going to be a general increase in footage annually, *i.e.*, about 120 feet a year and (2) the cultivators' expenses are likely to be reduced. The above-said device is under trial.

The details of the working of these Machines are tabulated below :—

Statement showing the details of bores

Serial No.	Name of Well Master.	Taluka	Village	Diameter of Boring	Depth of Boring in feet	Water after Boring in gallons per hour
	Poona District					
1	Mr. Hasan Husen ..	Khed ..	Chakan ..	4"	35'	200 Gallons
2	Mr. Ramchand Malukchand.	Bhimthadi ..	Jalochi ..	4"	70'	700 Gallons
3	Mr. Shankardas Tularam.	Haveli ..	Chinchwad ..	5½"	67'	*Nil.*
4	Mr. Maruti Malhar Manjre.	Khed ..	Chaken ..	4"	69'-6"	200 Gallons
5	Mr. Gangaram Lilachand.	Bhimthadi ..	Baramati ..	4"	75'	Do.
6	Mr. Pandharinath Keshav.	Do. ..	Do. ..	4"	74'	*Nil.*
7	Mr. Dagdu Ganpati ..	Haveli ..	Vadi-bolai ..	4"	106'	*Nil.*
8	Mr. Khubchand Kankushet.	Khed ..	Chaken ..	4"	75'	200 Gallons
9	Mr. Vishnu Abaji ..	Haveli ..	Chinchwad ..	3"	79'	*Nil.*
10	Rev. W. H. Stephens	Maval ..	Talegaon ..	5½"	215'-6"	*Nil.*
11	Mr. Manilal Laxmichand.	Khed ..	Chakan ..	4"	73'	200 Gallons
12	Mr. Anandram Manmal	Do. ..	Manchar ..	4"	306'	*Nil.*
13	Do. ..	Do. ..	Do. ..	4"	135'	*Nil.*
14	Mr. Narayan Mahadev	Haveli ..	Chinchwad ..	3"	130'	200 Gallons
15	Mr. Martand Bhiku ..	Do. ..	Vadi-bolai ..	4"	50'	Do.
16	Mr. Dattatraya Maharudra.	Bhimthadi ..	Baramati ..	4"	46'	700 Gallons
17	Mr. Dattatraya Maharudra.	Do. ..	Do. ..	4"	58'	300 Gallons
18	Mr. R. A. Rairikar ..	Haveli ..	Chinchwad ..	3"	160'	200 Gallons
19	Mr. S. K. Rande ..	Do. ..	Poona ..	4"	82'	*Nil.*
20	Mr. A. S. Irani ..	Maval ..	Valwan ..	3"	225'	*Nil.*
21	Do. ..	Do. ..	Do. ..	3"	50'	*Nil.*
22	Do. ..	Do. ..	Do. ..	3"	115'	*Nil.*
23	Mr. K. K. Chawre ..	Bhimthadi ..	Malegaon (Budruk).	4"	100'	*Nil.*
24	Do. ..	Do. ..	Do. ..	4"	70'	*Nil.*
25	Mr. F. E. Dinshaw ..	Haveli ..	Poona ..	4"	210'	200 Gallons
26	Do. ..	Do. ..	Do. ..	4"	100'	*Nil.*
27	Do. ..	Do. ..	Do. ..	4"	29'	*Nil.*
28	Mr. F. E. Dinshaw ..	Do. ..	Do. ..	4"	54'	*Nil.*
29	Mr. Rajamal Manmal	Khed ..	Manchar ..	4"	153'	*Nil.*
30	Mr. R. D. Shethana ..	Haveli ..	Yerwada ..	4"	85'	*Nil.*

taken during the year 1927-1928

Surface or well bore	Departmental charges	Labour charges	Cost of fuel lubricating oil, coal etc.	Total cost of boring	Cost per foot	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Surface ..	72 8 0	27 0 0	25 0 0	124 8 0	1 14 8	Completed this year previous work done 48·6 feet.
Well ..	80 0 0	47 0 0	117 2 0	244 2 0	3 7 10	Completed this year previous work done 40 feet.
Do. ..	*Nil.*	87 8 0	110 12 0	197 12 0	2 15 3	Completed this year previous work done 25 feet.
Surface ..	79 4 0	38 0 0	30 4 0	147 8 0	2 2 0	
Do. ..	87 8 0	24 2 0	33 8 0	145 7 0	1 15 0	
Well ..	*Nil.*	98 11 0	87 7 0	186 2 0	2 8 3	
Surface ..	8 0 0	164 0 0	104 8 0	276 8 0	2 9 9	
Do. ..	89 8 0	22 0 0	29 14 0	141 6 0	1 14 2	
..	..	..	..	..	..	Accident—Failure as tools remained in bore.
Surface ..	67 13 3	230 4 0	327 8 0	635 9 3	2 15 4	
Do. ..	84 8 0	23 0 0	34 12 0	142 4 0	1 15 2	
Do. ..	*Nil.*	182 8 0	147 2 0	329 10 0	1 1 3	
Do. ..	10 0 0	..	..	..	..	Information regarding the labour charge, etc., is not received from the owner.
Do. ..	170 0 0	52 0 0	38 6 0	280 6 0	2 3 3	
Well ..	94 0 0	94 0 0	67 8 0	255 8 0	5 2 5	The cost of transport cost much. Labour was very dear. The rock was very hard. Hence the cost per foot was very great.
Do. ..	46 0 0	34 0 0	87 12 0	167 12 0	3 10 4	
Do. ..	54 8 0	48 0 0	102 0 0	204 8 0	3 13 9	
Surface ..	215 0 0	71 0 0	64 3 0	135 3 0	0 13 2	
Well ..	*Nil.*	140 0 0	114 1 6	254 1 6	3 1 7	
Surface ..	*Nil.*	108 0 0	90 0 0	198 0 0	0 14 1	
Do. ..	*Nil.*	40 0 0	30 0 0	70 0 0	1 6 5	
Do. ..	*Nil.*	69 0 0	50 0 0	119 0 0	1 0 7	
Well ..	*Nil.*	65 0 0	52 12 0	117 12 0	1 2 10	
Do. ..	*Nil.*	22 8 0	19 12 0	42 4 0	0 9 8	
Surface ..	290 0 0	160 0 0	94 6 0	544 6 0	2 9 6	
Well ..	*Nil.*	107 0 0	81 1 6	188 1 6	1 14 1	
Do. ..	*Nil.*	28 0 0	18 8 0	46 8 0	1 9 7	
Do. ..	*Nil.*	45 8 6	35 4 6	80 13 0	1 7 6	
Surface ..	6 0 0	123 4 6	114 8 6	237 13 0	1 9 2	
..	..	..	..	..	..	In hand.

Serial No.	Name of well Master	Taluka	Village	Diameter of Boring	Depth of Boring in feet	Water after Boring in gallons per hour
	Poona District—contd.					
31	Mr. K. H. Tawre ..	Bhimthadi ..	Malegaon (Budruk).	4″	138′	*Nil.*
32	Mr. Tukaram Bappaji	Khed ..	Manchar ..	4″	100′	200 Gallons
33	Mr. N. J. Modi ..	Maval ..	Jambhol ..	4″	50′	*Nil.*
34	Do. ..	Do. ..	Do. ..	4″	115′	*Nil.*
35	Mr. S. G. Tambekar ..	Haveli ..	Bhamburda ..	4″	140′	*Nil.*
36	Mr. S. N. Chawre ..	Bhimthadi ..	Malegaon (Budruk). ..	4″	54′	200 Gallons
37	Mr. Ramchand Malukchand.	Do. ..	Jalochi ..	4″	36′	1000 Gallons
38	Rev. J. C. Winslow ..	Haveli ..	Bhamburda ..	4″	100′	200 Gallons
39	Mr. V. K. Patwardhan	Do. ..	Kothrud ..	4″	65′	200 Gallons
40	Mr. Ganpat Martand ..	Bhimthadi ..	Jalochi ..	4″	39′	*Nil.*
41	Mr. H. V. Tulpule ..	Maval ..	Vadgaon ..	4″	75′	*Nil.*
42	Do. ..	Do. ..	Do. ..	4″	62′	*Nil.*
43	Mis :—Baby Safiunisaw Begam.	Khed ..	Manchar ..	4″	210′	*Nil.*
	Sholapur District					
44	Mr. Baburao Hanmantrao.	Sholapur ..	Boramani ..	3″	52′	200 Gallons
45	Mr. Baburao Hanmantrao.	Do. ..	Do. ..	3″	38′	Do.
46	Mr. Mehatabchand Milapchand.	Sholapur ..	Sholapur ..	3″	59′	200 Gallons
47	Mr. Chanmalappa Ligade	Do. ..	Do. ..	3″	72′	Do.
48	Mr. Kasinathappa Patil	Do. ..	Degaon ..	3″	69′	400 Gallons
49	Mr. Hirachand Nemchand.	Sholapur ..	Sholapur ..	3″	65′	200 Gallons
50	The Raja Narsinggiraji Mill.	Do. ..	Do. ..	3″	91′	550 Gallons
51	The Raja Narsinggiraji Mill.	Do. ..	Do. ..	3″	73′-5″	300 Gallons
52	The Raja Narsinggiraji Mill.	Do. ..	Do. ..	3″	50′	250 Gallons
53	Mr. M. B. Kulkarni ..	Do. ..	Do. ..	3″	12′-6″	*Nil.*
	Ahmednagar District					
54	Mr. M. D. Kolhapure ..	Rahuri ..	Khadamba ..	3″	20′	200 Gallons
55	Rev. Steadman Aldis	Kopargaon ..	Puntamba ..	4″	120′	*Nil.*
56	Do. ..	Do. ..	Do. ..	4″	98′	*Nil.*
	Satara District					
57	Medical officer "Belair" Sanatorium.	Wai ..	Wai ..	4″	50′	*Nil.*

Surface or well bore	Departmental charges	Labor charges	Cost of fuel, Lubricating oil, coal, etc.	Total cost of boring	Cost per foot	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Well ..	*Nil.*	185 0 0	130 8 0	315 8 0	2 4 7	
Surface ..	137 0 0	82 3 6	99 1 3	318 4 9	3 2 11	
Well ..	*Nil.*	83 2 0	36 0 0	119 2 0	2 6 2	
Surface ..	*Nil.*	127 8 0	131 4 0	258 12 0	2 4 0	
Well ..	*Nil.*	148 3 6	72 4 6	220 8 0	1 9 2	
Do. ..	66 0 0	44 0 0	34 11 0	140 11 0	2 9 8	
Do. ..	36 0 0	43 0 0	31 12 0	110 12 0	3 1 3	
Surface ..	125 0 0	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.
Do. ..	72 8 0	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.
Well ..	..	..	..	..	..	In hand.
Surface ..	*Nil.*	135 10 0	87 0 0	222 0 0	2 15 4	
Do. ..	..	..	..	..	..	In hand.
Well ..	..	..	..	..	..	In hand.
Do. ..	53 0 0	90 0 0	141 14 0	284 14 0	5 6 5	
Do. ..	38 0 0	40 0 0	73 7 0	160 7 0	4 3 7	
Surface ..	63 8 0	63 3 6	29 4 6	156 0 0	2 10 3	
Do. ..	83 0 0	66 4 0	33 5 0	182 9 0	2 8 7	
Well ..	78 8 0	58 2 0	61 0 0	197 10 0	2 13 10	
Surface ..	72 8 0	68 5 0	30 13 0	171 10 0	2 10 3	
Well ..	115 8 0	..	..	..	..	*
Do. ..	95 2 0	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.
Surface ..	50 0 0	..	..	..	..	
Do. ..	..	..	..	..	..	In hand.
Well ..	20 0 0	42 0 0	53 0 0	115 0 0	5 12 0	Completed this year; previous work done 16 feet.
Surface ..	*Nil.*	93 6 0	71 4 0	164 10 0	1 1 7	Completed this year; previous work done 98 feet.
Do. ..	*Nil.*	126 6 0	74 7 0	200 13 0	2 0 10	
Well ..	*Nil.*	..	..	..	..	Information regarding the labour charge, etc., is not yet received from the owner.

Section IV-B.

(47) *Engineering Advice and Assistance.*—The Mechanical Assistant looked to Power Plants at Manjri, Loni and Kopergaon. He erected machinery at District Agricultural Show, Nagar and demonstrated the same. Besides this, during the year under report his services were fully utilised as under, both departmentally and in the interest of cultivators. Since the Presidency Agricultural Show there has been a keen demand on the services of the Mechanical Assistant by cultivators and hence the work is increased in the Division.

(*a*) *Erection of new Plants and Machinery.*—Help was rendered to cultivators in lining out the foundations of 3 Power Crushers. With the crushers three types of lampless Engines were introduced of the following makes :—

(1) 32 B.H.P. Blackstone Crude Oil,

(2) 24 B.H.P. Campbell Crude Oil, and

(3) 12½ B.H.P. Shanks Crude Oil.

The number of Power Plants on the Canal Area has now increased to 52 Plants. On the Manjri Farm, Broad Bent Centrifugal Machine was erected and worked.

(*b*) *Mechanical Advice.*—He visited 28 Power Crushing Plants and eight Pumping Plants of the cultivators and gave them advice. He prepared estimates of Pumping Plants for 15 cultivators of the following Districts :—

Nagar	..	..	..	2
Satara	..	..	..	10
Poona	..	..	..	3

He helped for the erection of two Bulsar Rahats, one at Manjri and one at Rahuri. He undertook tests of Bullock Power Crushers of Satara Industrial Works and gave them advice as regards changes required in the crushers.

(*c*) He wrote an interesting article in Marathi on "Power Crusher and its Management" in which full detailed information has been supplied to the owners of Power Crushers, which has served as a guide and has been found to be useful.

Section IV-C.

(48) *Pig-Killing Campaigns.*—As reported in last year's report the work progressed on the same lines as outlined there. The demonstrations at the Presidency Agricultural Show and consequent work has developed demand on the Pig-Officer and as a result the Pig-Officer was fully busy during the year with Campaign work and the cultivators have commenced to co-operate with their personal help in the campaigns, in addition to monetary help. These results can be very well seen in the following statement which gives the summary of the whole year's work under different sections :—

Serial No.	Tracts or villages worked	Pigs killed	Cost of the work	Cost per pig killed	Area of crop protected	Cost per acre protected	Remarks
1	2	3	4	5	6	7	8
			Rs. a. p.	Rs. a. p.		Rs. a. p.	
1	Palshi, Kolawdi, Ambode and Gujarwadi, Taluka Koregaon. (A)	52	382 0 0	7 5 6	450 Acres Groundnut. 15 Acres Potatoes.	0 6 0 per acre per month	Three days' work of Poona party, 8 days work Poona gunmen and local gosawi beaters and 1½ month Poona gunmen, gun-club and village beaters. *(Personal and monetary help.)*
2	Godawari Canals, Punyamba and Mungi. (B)	103	535 0 0	5 3 1	2,000 Acres Cane. 5,000 Acres Jowar.	0 2 10 per acre of cane per month 0 0 10 per acre of Jowar per month.	Poona party. *(Monetary help and personal help in case of Mungi.)*
3	Mungi (C) ..	17	62 0 0	3 10 0	5,000 Acres Jowar.	0 2 5 per Acre per month.	Supplementary work one gunman and village Beaters. *(Monetary and personal help.)*
4	North Koregaon 30 villages (A)	89 and 2 Panthers	769 0 0	8 7 2	15,000 Acres Jowar.	0 0 6 per acre of Jowar per month.	Poona party. Gun-club and village beaters. *(Monetary and personal help.)*
5	D7 and Harrison Branch (B)	19	84 3 0	4 6 1	2,000 Acres Cane.	0 1 6 per acre per month	Three gunmen and local Vaidu Beaters. *(Monetary help.)*
6	Godawari R. and L. B. Canals (C)	115	511 10 0	4 7 1	5,040 Acres Cane.	0 1 5 per acre per month	Gun-club work. Four gunmen and local vaidu beaters and dogs. *(Monetary help.)*
7	Khadakwasla and Sinhagarh villages (C)	41	49 0 0	1 3 1	....	....	Ammunition only. Gunmen kept in practice *(Personal help.)*
8	Nangaon pumping Plant area (C)	2	20 0 0	10 0 0	....	....	Three wounded found dead.
9	Pravara L. B. Canals, D6 and D7. (C)	13	13 0 0	1 0 0	....	....	Gun-club work. Ammunition only *(Personal work.)*
10	Palshi-Kolawdi (C).	9	18 0 0	2 0 0	....	....	Gun-club work. Ammunition only *(Personal work)* 27 pigs in monsoon campaigns, *vide* item (1) above and 24 in Rabi campaigns, *vide* 4 above.
		460	2,443 13 0	5 5 0	....	....	

"A"—Regular party and Gun-club.
"B"—Regular party.
"C"—Gun-club.

So far, the results of a Pig Campaign were judged from the cost of actual kills of pigs, but it was found from the experience that when once the Shikar Party passes through a cane-tract, that tract is not visited by pigs for a month from the date of Shikar Party's leaving the tract. Thus the actual immediate protection is served for a certain period and hence in the above statement where damage is high the actual protection cost is shown. In case of other crops the actual cost of protection is based on the watching period through which the campaign is conducted. The Gun-Clubs which are reported in last year's report have too progressed well in their work but still some more departmental help is necessary for some period to make them work permanently.

The Pig Officer's services were spared for the Southern Division for a period of 2½ weeks twice and the work done there will be found to be reported by the Deputy Director of Southern Division.

Section IV-D.

(49) *Field Embankments.*—The Bunding Officer surveyed and prepared plans and estimates of 22 schemes estimated at Rs. 25,200 and these schemes are under construction. There is a great demand on his services from private cultivators as well as through Revenue Officers. In addition to this, he disposed off 254 Tagavi applications which required his technical advice and which are received through the Collectors and Revenue Officers and Assistant Collectors of Poona, Nagar and Sholapur. He demonstrated, by construction of Models, the Land Development Schemes in Famine Areas at Nagar District Agricultural Show and Sangli and Kolhapur Agricultural Shows.

Section V.

(50) *Agricultural Education.*—The Marathi Agricultural School at Loni Kalbhor was run on the same lines. Out of 159 applicants, 26 boys were selected, but 23 only remained throughout the year in the first year. The following statement shows the results of the examination :—

Year	No. of boys	No. of boys appeared for examination	No. of boys passing the examination
1st year	23	23	20
2nd year	22	22	22

The expenses of the year amounted to Rs. 15,232 and the receipts came to Rs. 1,373.

The boys had arranged to run their Clubs and it was found that the expenses of boarding had been less when compared to past years. The expenses of meals came to Rs. 7-11-6 per month per boy against Rs. 8-6-9 per month per boy in the year 1926-27. The management of boarding gives them tuition in marketting and organising their own family affairs.

During the year, 7 teachers were deputed by the Educational Department from Thana, Nasik, Satara, Sholapur, East Khandesh, West Khandesh and Nagar and these were trained for Agricultural Bias Classes. The teachers deputed joined the school as late as July 20th and hence the school staff had to keep the school open for a fortnight more than usual time, to train them. Out of 7 only 4 passed the examination.

In this Division there are now 16 Agricultural Bias Classes and every help was rendered to the schools for arranging the cropping schemes, examining boys, etc., by the District staff.

The Loni Agricultural School was visited by the Chief of Sawantwadi and the Honourable Minister for Agriculture, Madras.

Section VI.

(51) *Co-ordination of Revenue, Irrigation and Agricultural Officers.*—It will be seen from the above that District and Taluka Agricultural Shows, Jamabandi Demonstrations and Shows on Canals were held in numbers in this Division, which could not have been done to success without the help of the Officers of Revenue and Irrigation Departments. Hence there was whole hearted support from the officers of both the Departments. Amongst Revenue Officers, Assistant and District Deputy Collectors Messrs. Bhansali, Bhat, I.C.S., and Phanse took greatest part in addressing at several places and impressing the cultivators about the Agricultural improvements. Similarly amongst Irrigation Officers Mr. Champekar, M.C.E., took great interest. Mr. R. S. Bapat of Irrigation Department and Mr. Shaik, District Deputy Collector, Poona, continued their enthusiastic support like last year.

The Mamledars in my Division co-operated and helped the staff in conducting the steeping demonstrations and amongst all Mr. S. K. Duduskar, Mamlatdar of Koregaon, worked enthusiastically and rendered excellent help in organising and conducting Pig Campaigns in 40 villages.

In addition to the above Officers, Rao Saheb Adhav, President, District Local Board, Satara, and Khan Bahadur Cooper greatly helped the Department for the co-ordination of the District Local Board Scheme.

(52) *Divisional Board of Agriculture.*—From 1st November 1927 the chairmanship of the Divisional Board came to me as per Government Resolution No. 4062/24, dated 17th May 1926, Revenue Department, and since then three meetings were held. The chief work, as usual, consisted of recommendations for subsidies to Taluka Development Associations, supervision of the work done by the staff and recommending applications for loans for Agricultural Improvements.

(53) *Miscellaneous.*—The activities in the District have increased owing to the Presidency Agricultural Show and the limited staff with a very limited T. A. Grant has to meet with it. I and my staff rendered

advice and help in the organisation of Shows at Sangli and Kolhapur which were organised by the respective States. Similarly the Railway Company was helped in demonstrating Cinema Films at different stations. Local and Provincial Newspapers, Shetki and Shetkari and Agricultural College Magazine were supplied with interesting agricultural matters during the year by the staff in this Division. Besides this, several broad-cast talks were given.

The staff on the whole has worked well with a few exceptions.

B. P. VAGHOLKAR,

Deputy Director of Agriculture,

S. C. D., Poona.

APPENDIX E.

Summary of the work done under the Deputy Director of Agriculture, Southern Division, Dharwar, for the Year 1927-1928.

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, throughout the year. Mr. R. Y. Hulkoti continued to act as Inspector of Agricultural Schools and Mr. V. C. Pavate as Head Master, Devihosur Agricultural School. Mr.V. N. Apte, the Graduate Assistant on Dharwar farm, was appointed as Superintendent, Gokak Canal farm, and Mr. A. R. Neginhal was taken for District work. Mr. V. S. Kulkarni who was lent to the Dharwar District Agricultural Association, went on sick leave for six months from 1st April 1928 and Mr. D. M. Kulkarni, a Graduate Assistant, was lent to the Association from that date. Mr. G. Y. Kurli, who was on deputation for 2 years, returned on 10th May 1928 and was posted on Gokak Canal farm.

The organisation of the District staff, brought about in the year 1923-1924, still continued, under which the officers did both propaganda and organisation work.

Season.

(2) With good anti-monsoon and early monsoon showers, preparatory tillage and sowing operations of Kharif crops were satisfactory and the season opened with bright prospects. Two long breaks, however, one in August and the other in October, considerably affected almost all Kharif crops. In the eastern dry tract, they suffered more than in the West. Rains in November considerably saved the situation and were very useful to Rabi crops. The attack of grass-hoppers on jowar crop and that of wilt on cotton, were conspicuous during the year. Season on the whole was good for wheat and only fair to other crops. There was good water supply in wells and garden crops thrived well all over the Division. The supply of fodder and drinking water was adequate.

(3) The work done by different sections is summarised under the same heads, as it was done in previous years to facilitate references and comparison, where needed, *viz* :—

(*a*) Research and Experiments,
(*b*) Propaganda,
(*c*) Organisation,
(*d*) Direct services to the public,
(*e*) Agricultural Education and
(*f*) General.

(a) Research and Experiments

(4) *Dharwar Farm.*—Plant breeding work on cotton continued to receive close attention on this farm. Dharwar No. 1 x Rosea Cross No. 15 was compared with Dharwar No. 1 and Dharwar No. 2 cottons in 7 replications in a wilt-free-plot. Both the yield and ginning percentage of the cross are higher than those of either Dharwar No. 1 or Dharwar No. 2. The colour is also brighter. Its staple is slightly inferior to that of Dharwar No. 1 but compares well with that of Ordinary Kumpta and far superior to that of Dharwar No. 2. Selection was made for yield in strain No. 14, which gins 38 and has a staple as good as that of Dharwar No. 1. One is found to be early and good yielding and it will be tested during the coming season. Both these strains, No. 15 and 14, however, are not wilt-resistant.

(5) Breeding wilt-resistant types of cotton also received much attention. In Dharwar No. 1 x Wagale cross, which was found to be impure last year, further selections were made. Of these, two strains, *viz.* No. 13-9-8-4 and 13-9-8-6 are promising. They gin 28 per cent. and resist wilt. The staple, in both the cases, is fully one inch. These will be tried during the coming year. Two strains of Dharwar No. 1 x Dharwar No. 2 cross (1 and 6) were compared with Dharwar No. 1 and Dharwar No. 2 in 5 replications in a wilt affected plot. The following statement summarises the results :—

Serial No.	Name of cotton	Yield kapas per acre	Ginning per cent.	Percentage of wilted plants	Remarks
1	Dharwar No. 1 ..	225 lbs. ..	27	46.9	
2	Dharwar No. 2 ..	456 lbs. ..	26	3.6	
3	Dharwar No. 1 x Dharwar 2 strain No. 1.	499 lbs. ..	27	3.7	
4	Do. do. 6 ..	469 lbs. ..	27	4.5	

Spinning tests of this year have confirmed the results of last year and attempts will be made to introduce this cross in place of Dharwar No. 1, especially in wilt affected fields.

As Dharwar No. 1 x Rosea strain No. 15 is also liable to wilt, it has been crossed with Dharwar No. 2 and Kumpta wilt resistant type. The crosses have reached F3 generation. Selection is continued in promising members. Some useful observations made during the past two years on percentage of death by wilt at different stages, disclose some connection between low temperature and greater percentage of death. They need verification and observations will continue. The behaviour of different cottons during the 3rd stage (11 to 16 weeks of life) when death percentage is large and when the loss is much felt by the cultivators, is also under study.

(6) A long stapled herbacium cotton from Tashkant, has been crossed with Dharwar No. 1 and Kumpta wilt-resistant cotton for further study.

Among the high ginning cottons Comillas continued to top the list. Three strains ginning 48-50 per cent. are maintained and the best one will be selected from these during the coming season. Waggi strains selected from Burma cotton, are also valuable, as they gin high and possess fairly long staple. Selection No. 8 is pure for these characters and will be continued. Sangunium cotton has yielded one strain which bears more number of bolls than any other cotton examined up till now. The heredity of this character is being studied in the cross between Dharwar No. 1 and this strain.

(7) Selfing and multiplication of Dharwar No. 1 and Gadag No. 1 cottons on Dharwar farm, continued. 100 lbs. of Dharwar No. 1 and 30 lbs. of Gadag No. 1 seed, have been produced by selfing, which are sufficient for dibbling 25 and 6 acres, respectively. Dharwar No. 1 selfed seed will be grown in a reliable cultivator's field instead of on the farm, which is badly affected by wilt. Dharwar No. 1 x Dharwar No. 2 wilt resistant strain will occupy the place of Dharwar No. 1 cotton on the farm. Gadag No. 1 will be multiplied on the farm as usual in its 2nd generation.

(8) *Other cotton breeding work.*—No fresh selections were made during the year in Kumpta cotton. Selections mentioned in last year's report were not found to breed true for the high yielding character. An attempt to get a strain which contains all three good characters (staple, ginning percentage and wilt-resistance), has not yet succeeded.

(9) Study on correlation between ginning percentage and other economic characters in Kumpta cotton, continued and an article will be written on the subject by the Cotton breeder, when that study is completed.

(10) In jowar, promising strains of important local varieties, Nandyal, Bilichagan, Fulgar white, Fulgar yellow and Savaner, were maintained pure by the use of selfed seed. A comparative trial of these varieties was vitiated by grass-hoppers-attack. Fresh selections in Muddinandyal were found to be still splitting and some good ears were further selected. A small number of ears was also selfed in other early varieties including those that were obtained from America. Milo types of American variety were found to be immune from smut.

At a Research Committee meeting held in Poona, it was decided that kharif jowar breeding work on Dharwar farm, may be stopped, as there are numerous varieties in the tract and the types selected on the farm, may not generally suit. It was settled that only a selected strain of Bilichagan variety for which there is general demand, should be maintained.

(11) In groundnut two strains No. 5 and No. 10-4 of Spanish peanut were tried with unselected seed and small Japanese variety. Strain No. 10-4 gave better results than others. Strain No. 5 has done slightly better than unselected seed. These two strains will be continued.

(12) Other useful experiments conducted on Dharwar Farm under the guidance of the Superintendent, are summarised below :—*Crop Experiments.*—Nipani and Nadiad No. 6 varieties of tobacco were tried. They suffered from Cercospora nicotianæ disease as identified by the Plant Pathologist, Poona. Nipani variety suffered more than Nadiad No. 6 and gave less yield. The experiment will be repeated. During the past 4 years tobacco has been producing fair yields and net profits, as compared to cotton and a leaflet on the subject (No. 10 of 1927) was published in which it was shown that when prices of cotton go below Rs. 250 per Naga, it would be more profitable to grow tobacco.

Lucern as a dry crop gave 10,390 lbs. green fodder per acre. Jowar after lucern gave as high a yield as 3,255 lbs. grain and 8,452 lbs. fodder per acre. Lucern, tobacco and groundnut are observed to be better than cotton, as rotation to jowar crop.

(13) *Manurial experiments.*—Application of 15 tons of Farm yard manure per acre in alternate years to jowar crop, gave better results than smaller dozes during the year. Effects of san green manure on both jowar and cotton crops, have been marked. Among the artificial manures in one experiment, Calcium cynamide did better than ammonium sulphate on cotton crop and both of them did better than no manure plot. Safflower cake and ammonium sulphate have given better results than Amophos and no manure in another experiment.

(14) In the small garden on Dharwar farm, figs and mangoes continued to receive attention. In all 412 mango grafts were prepared and sold during the year.

(15) *Gokak Farm.*—Sugarcane continued to be the most paying crop on the farm. Maize with tur as a row crop continued to give better results than maize after maize, though tur was affected by wilt to a certain extent during the year. There is a large scope for introduction of tur as a row crop in maize in the Gokak Canal tract but as the cultivators under the new rules are required to pay additional water charges, they are not freely taking to it. Tur does not require as much water as other Rabi crops. If water charges are proportionate to the requirements of different crops, the system of growing tur with maize, is likely to be very popular. Cotton crop continued to be a good rotation to sugarcane and maize. Spacing experiment on cotton proved that rows 2′ apart are better than 3′. The local method of growing Rala mixed with cotton was found better than growing cotton alone. Other crops of importance experimented under the Gokak canal conditions, were tobacco, lucern, turmeric and groundnut. Tobacco suffered from disease. Turmeric owing to the prevailing low price for it, did not give any net profits. Lucern and groundnut did well. Cultivation of groundnut is increasing.

(16) *Manurial experiments.*—Amophos manure on sugarcane did not compare well with ammonium sulphate and cake manure. Pig manure continues to be a good substitute for farm yard manure on both cane and maize crops. Mixture of groundnut cake and ammonium sulphate continued to give better yields than other top-dressing agents.

(17) The orchard and the nursery on the Gokak farm continued to work at a profit. The total expenditure was Rs. 540 and receipts were Rs. 1,238 during the year. Under the conditions of Gokak canal tract, sour lime and mosumbas seem to be better fitted than others.

(18) *Mugad Rice Breeding Station.*—The distinguishing characters of 79 Antersal and 87 Mugad strains were studied. 15 promising strains of each variety were compared under replications, with check strains repeated after every group of 4 strains. The following were found to be promising :—

Antersal		Mugad	
A 67	Semi early.	M 146	Very early.
A 90	Intermediate.	M 161	early.
A 200	late.	M 81	Intermediate.
A 194	late.	M 249	Intermediate.
A 210	late.	M 141	Late.

A 200, M 161, M 249, and M 141 were also tried in cultivators' fields on a large scale during the year and they have given higher yields than local. The seed of these strains is being multiplied. Study on the cross between Mugad and Kolamba variety and that on Gonag, continued and points of economic importance were given special attention.

(19) *Tegur Cattle Breeding Farm.*—The progeny in the 3rd generation of the cross shows marked improvement. The bull calves bred on the farm, have continued to attract the attention of the cultivators in the neighbouring villages. 13 bull calves and 10 cow calves were born during the year. The total number of the herd on 31st March 1928 was 128, valued at Rs. 6727 against 138, valued at Rs. 7705 last year. Sheep also have considerably improved in quality, after crossing with Marino ram. They suffered, however, much from Hemoncus contortus and are under the treatment of the Veterinary Doctor. The total expenditure on 128 animals including the pay of the monthly men and repairs to buildings, came to Rs. 2,937 and receipts Rs. 1,170. Hay and silage of grass were prepared and fodder crops suitable to the conditions of rainfall were grown on the farm. Very little concentrated feed was purchased from outside.

(20) *Experiments in cultivators' fields.*—As usual, the District staff undertook general trials of crops and application of manures in cultivators' fields. Trials with several selected strains of kharif jowar indicated that Savaner was a very early variety giving 1,400 lbs. grain per acre in 3½ months in the Bailhongal tract, as against 900 lbs. of the local variety in 5 months. In other places Bilichagan confirmed the results of last year as a good yielder and attracted the attention of farmers. Of the strains of paddy selected on the Mugad farm, M 141 has shown a uniform higher yield than the local in some places yielding 20 per cent. and more than the local Dodda Bhatta. M 249 did well in the Mundgod Petha and yielded 2,220 lbs. paddy per acre against 1,800 lbs. of the local variety. It was found to ripen earlier than M 141. Pure seed of the recently imported Spanish peanut showed better yields than the local

seed at all places, except in the Gadag tract, where Pondicherry has been considerably recording superior yields. The area of Spanish peanut is increasing in the general tract, so much so, that special pure seed growing arrangement promises to be a useful move. Nadiad No. 6 tobacco yielded 1050 lbs. dry leaf per acre, against 840 lbs. of the local variety at Nipani. The trial will be repeated.

Experiments with poudrette at Dharwar indicated an increase in the yields of kharif potato by 50 per cent., of kharif jowar by 37 per cent., of cotton by 44 per cent. and of sugarcane in the Chikodi tract by 20 per cent. Night soil showed equally good results on garden crops such as plantains, chillies and vegetables at Bijapur. Its use is, wherever it is available, therefore, finding very rapid favour amongst the local cultivators and it will be a very useful addition to the local supply of manure.

Bonemeal, groundnut cake and ammonium sulphate as top-dressing manures to rice, have considerably proved to be effective and economic in securing increased yields and their use is steadily increasing in the rice tract. Trials conducted during the year under report at several places, confirmed the results of past years and the crops were demonstrated to cultivators.

(*b*) *Propaganda*

(21) *District Cotton work.*—As usual, the Cotton staff attended to the work of multiplying Dharwar No. 1, Gadag No. 1 and Dharwar No. 1 x Rosea cross cotton seeds round Hubli, Gadag and Bailhongal, respectively. Seed of different generations was sown under supervision in the reserved areas and crop was inspected from time to time. The produce was collected and ginned separately and the seed obtained was cleaned and stocked for distribution during the coming season. The work done may be summarised in the following statement :—

Name of variety	Generation	Quantity of seed distributed in lbs.	Area sown in acres	Quantity of produce in dokras	Quantity of seed stocked for use at the ensuing season
Dharwar No. 1 ..	III	1,040	191	143	47,516
Do. ..	IV	22,611	2,576	975	2,50,000
Do. ..	V	41,460	7,900	970	3,03,500
Gadag No. 1. ..	III	500	58	46	10,708
Do. ..	IV	7,447	854	446	1,03,973
Do. ..	V	77,368	7,903	2,821	6,26,152
New Cross ..	III	120	12	9	1,781
Do. ..	IV	5,705	800	700	40,000
Do. ..	V	11,547	1,000	700	70,000

Owing to financial difficulties, Hubli Cotton Sale Society could not purchase large quantity of seed from the crop of the 5th generation and so there will be a fall in the area under Dharwar No. 1 cotton from the

pedigree seed during the coming year. Progress round Gadag and Bailhongal continues to be good.

(22) For distribution of general seed, the Officers of the Agricultural Department and Sale Societies worked together. 24 depots were established for distribution of Dharwar No. 1 and 27 for Gadag No. 1 cotton seed. These include the Seed Societies also. Sardar Mahabooballikhan of Hubli and Gadag Dalals' Association also stocked and distributed large quantities of Dharwar No. 1 and Gadag No. 1 cottons, respectively. The estimated areas in acres under these two cottons were as under:—

Name of the variety	Area controlled by the Cotton staff	Area controlled by the Cotton Sale Societies	Area uncontrolled (Bazar seed)	Total
Dharwar No. 1 ..	7,900	1,44,120	25,800	1,77,800
Gadag No. 1 ..	8,815	49,500	43,700	1,02,015

Spread of Dharwar No. 1 cotton round Bijapur and Bagalkot continues to be very limited.

(23) *Grading.*—The other important work done by the Cotton staff was grading cotton in auction sales. In all 1,821 dokras of Dharwar No. 1 cotton in Hubli and Haveri Cotton Sale Societies and 9,744 dokras of Gadag No. 1 cotton in Gadag Cotton Sale Society, were graded against 2,664 and 6,698 respectively last year. The Hubli Cotton Sale Society continued to sell most of its cotton by private treaty owing to financial difficulties. 1,314 dokras of Dharwar No. 1 x Rosea cotton were graded and sold by auction at Bailhongal. Further spread of this cotton will be worked through Bailhongal Cotton Sale Society.

(24) *Working of the Cotton Transport Act.*—875 licenses for 23,938 dokras of cotton were issued to the cultivators of Nizam's Dominions and Madras Presidency bordering Gadag, to bring their cotton to Gadag Market, and 324 licenses for 9,785 dokras to the cultivators of river side villages in the Bijapur area, to bring their cotton to Bagalkot Market.

The import of fly was altogether stopped by rain; but it continued to come into Gadag market to a certain extent by roads without licenses. Attempts to trace the sources from which it comes, have not been successful. In order to stop import of fly and inferior cotton into Dharwar-Kumpta area by roads, 8 check-stations have been sanctioned by Government and they will be established during the coming season. On the whole, the Cotton Transport Act worked well in the interest of the grower and the consumer of Kumpta and Dharwar American cottons.

(25) *General District Work.*—The District staff, as usual, held numerous demonstrations of improved implements, such as the iron ploughs, wheat-

thresher, chaff cutter, groundnut sheller, iron scraper, stone roller for threshing jowar, improved sugarcane mill and Poona gul boiling furnace in their jurisdictions. The wheat thresher was much appreciated this year, as the wheat crop was fairly good and the economy in labour and time, effected by the machine, was very valuable. The bullock gear chaff cutter has been well received and demonstrations of the same were conducted at important centres in the Division. The yearly increasing area under groundnut in the Dharwar District, has created a demand for economic shellers to cope with the yield. Power-shellers are being established in big centres in the Haveri tract and their service is widely taken to by farmers. To enable the farmer, however, to deal with his own produce, hand-shellers were demonstrated at 8 places in that tract with success. In the village of Mantgani, the farmers co-operated and shelled 1,400 bags of groundnut with hand-shellers to their advantage. As the hand-shellers turned out cleaner and less damaged seed than the power-shellers, the growers realised better prices. These are likely to be popular, as they enable the farmer to utilise his own labour at a time, when he is likely to have less work on his farm. The tractor has been a recent introduction. The machine owned by the Dharwar District Agricultural Association with Government aid, gave three demonstrations and ploughed 80 acres in 31 working days and realised Rs. 2,590 at a total cost of Rs. 2,500 excluding depreciation but including repairs. Due to peculiarly unfavourable weather during the season under report, the machine could not effect as much work as was expected from it. Its work is, however, well appreciated by farmers. Two more tractors have been purchased, one at Bijapur and the other, at Hirekerur in the Dharwar District.

(26) Agricultural Conferences combined with Cattle Shows and demonstrations, were held at Chikk-Handigol, Savadi Savanur, Hosritti, Shirgod and Balagalpet in the Dharwar District, and at Bijapur and Sadalga in the Bijapur and Belgaum Districts, respectively, when lectures on agricultural improvements were delivered and public attention drawn to questions of direct utility to the tracts. Agricultural discourses were arranged by the District staff during 15 Revenue Jamabandi meetings of village officers in the Dharwar and Bijapur Districts. The meetings were presided over by Revenue officers of the tract. Similarly lectures on agricultural subjects were delivered at the annual Patils' Training Classes and the sympathetic co-operation of the village officers for agricultural propaganda, was sought for.

(27) *Propaganda against jowar smut.*—This work was continued mainly through Revenue Officers. The District staff conducted demonstrations in co-operation with the Mamlatdars at important centres and the latter distributed the copper sulphate packets. In all 31,920 packets were distributed (18,468 in the Dharwar District, 6,680 in the Bijapur District, and 6,772 in Belgaum District). This was sufficient, on an average, to protect seed for 1,27,680 acres. It was mostly used for kharif jowar which is the one most susceptible to this disease.

(28) Information on agricultural matters and on improvements advocated by the Agricultural Department, was freely given to all that sought for it by letter or personal inquiry and every occasion was utilised to interest the public in this direction. Articles on the pressing questions of the time, such as remedies against jowar-hoppers, were published in the Kanarese Agricultural Magazine and Departmental leaflets were distributed at all conferences and demonstrations.

(c) *Organisation*

(29) *Organisation.*—Co-operative organisation among farmers for supply of their agricultural requisites, was extensively advocated at all demonstrations and conferences. Efforts to amalgamate the small seed, implement and manure societies into Taluka societies so as to make them more active and useful than hitherto, have not been successful. Amongst these small ones, those at Devi-hosur, Betgeri, Mulgund and Hulkoti were fairly active.

(30) Among the Co-operative Cotton Sale Societies the Bailhongal society held for the first time auction sale of its cotton. The work done by the various societies in the Division is tabulated below :—

Serial No.	Name of society	Number of members	Share capital	Sold by auction sales	By private treaty	Total	Value of cotton sold
			Rs.				Rs.
1	Hubli ..	2,516	16,772	581	16,583	17,164	9,24,644
2	Gadag ..	1,989	40,333	9,528	4,058	13,586	8,66,979
3	Haveri ..	694	7,240	1,240	700	1,940	1,05,061
4	Bijapur ..	165	2,680	221	1,452	1,673	1,05,852
5	Bagalkot ..	224	4,845	..	567	567	36,111
6	Bailhongal ..	214	2,750	1,314	6,000	7,314	4,40,000

(31) The Nipani Tobacco Sale Society sold 'Jarada' worth Rs. 34,453. Activities to form jarada making centres in villages, continued. It is expected that these centres will help the Sale Society to draw greater produce and show better progress next year.

(32) The Sankeshwar General Sale Society recorded further progress in its sales during the year. It sold gul, chillies, ground-nut, san fibre, cotton seed, jowar and other agricultural produce, worth Rs. 30,533. In addition it distributed 16½ tons of Sulphate of Ammonia worth Rs. 3,936.

(33) The progress of the Byadgi Chilly Sale Society was not very satisfactory during the year. The total sales amounted to Rs. 18,710. The establishment charges were too high for the amount of business done.

(34) Of the Cattle Breeding Societies, that of Sidenur continued to show good progress. The new bull is giving very good service and the young stock obtained from crossing local cows with the Mysore bull

have been very much appreciated by the people. Other societies are doing only fair work.

(35) *Fencing societies.*—The big Arbhavi scheme which protects 5 villages, has now been ready and orders for 6 miles fence are being placed. Six small schemes protecting in all an area of 1,084 acres in the Mundgod Petha, have been worked out and collections are in progress. Kadankop and Tadas schemes are still pending owing to some local difficulties. The Bandur scheme did not mature. The old fencing societies in the Kalghatgi taluka have been realising the benefits of their stone wall fencing. The walls, however, are falling at certain places and need repairs. At the present rates, fencing with the woven steel wire fence, is found to be cheaper and this will be adopted in future schemes. Ten mile woven fence has been ordered and there is a demand for another ten miles. Several individual cultivators fenced small areas of their own during the year in the Dharwar and Kalghatgi talukas of Dharwar District and in Mundgod Petha of the Karwar District. The work of fencing against pigs is extending and needs special staff.

Campaigns for the removal of prickly pear which shelters wild pigs continued in the Mundargi Petha of the Dharwar District. So far 3,600 acres have thereby been protected from the ravages of wild pigs in that Petha, with immense benefits to the local cultivators.

(36) *Other Land Development Societies.*—Members of Yelvigi Waddars' Society have brought their lands under cultivation after putting in their field embankments. The Maharajpeth Joint Cultivation Society cultivated about 100 acres of land during the year and are thinking of undertaking an irrigation scheme for their estate.

(37) *Taluka Development Associations.*—During the year under report a Mahal Development Association for the Murgod Petha in the Belgaum District, was newly started. There are now 12 Taluka Development Associations in the Division, 6 in the Dharwar District, 4 in the Belgaum District and 2 in the Bijapur District. They distributed copper sulphate packets and demonstrated steeping of jowar seed. They conducted demonstrations of crops and implements and held shows and conferences. Conferences arranged by Chikodi Association at Sadalga, by Haveri Association at Hosritti and by Bijapur Association at Bijapur, were very instructive. Haveri Association arranged demonstration of tractor in co-operation with the District Agricultural Association. The financial position of Chikodi and Haveri Associations, is good and that of others is only fair. These Taluka Development Associations are useful bodies for Agricultural propaganda, but their financial position needs improvement. The total amount of Government subsidy given to the Association in this Division during the year, was Rs. 4,449.

(38) *The District Agricultural Association, Dharwar.*—This body continued to do useful work. 102 bags of Dharwar No. 1 cotton seed and 929 mango grafts were distributed during the year. The hire proceeds of iron ploughs came to Rs. 117. The tractor owned by the Assso-ciation ploughed 81 acres in 31 working days and was demonstrated in

three places in Haveri Taluka. The tone and get up of the magazine published by the Association has improved and Government hand continued to work for the Association.

(39) The Divisional Board held its quarterly meetings regularly and guided the work of the Taluka Development Associations and the District staff of the Agricultural and Co-operative Departments. Many useful subjects, such as the Bombay Cotton Markets Act, Organisation of poultry Associations, etc., were discussed. Subsidies to various Taluka Development Associations were recommended.

(*d*) *Direct Services to the Public.*

(40) *Field Embankments.*—One Bunding Officer continued to work in Bijapur District and the other in Dharwar and Belgaum Districts. District Agricultural Overseer, Bijapur, and Bagewadi, also inspected bunding works and gave necessary advice. In Bijapur District, bunding work is making good progress. 44 schemes in 40 villages were dealt with. Plans and estimates were prepared and traced copies of 33 schemes were sent to the Collector for distribution to the cultivators concerned. The estimated cost of these 44 schemes was Rs. 65,400. In addition to the above, 22 schemes for reclamation of small nala beds were prepared. Besides preparing fresh schemes, 90 executed works in 50 villages were inspected. In Belgaum District, Tallur Joint Bunding scheme was completed and part actually executed at a cost of Rs. 3,000. This co-operative scheme is very instructive and stands as an object-lesson to others. Fresh schemes for 40 survey numbers extending over 500 acres and costing Rs. 9,000, have been prepared. The Bunding Officer for Dharwar and Belgaum Districts concentrated his attention during the year in Savadatti, Gokak and Athani talukas of the Belgaum District. Demand for advice, plans and estimates on bunding, has very much increased and can not adequately be met with the existing staff.

The Director of Agriculture, Bhavanagar State, and his Assistant received training in field embankments during the year in this Division. Special Head Karkoons and Circle Inspectors in Bijapur District were trained to give advice on small schemes at the request of the Collector.

Interesting models and charts of bunding were exhibited in two agricultural conferences.

(41) *Boring.*—Out of 5 machines, two were lent to the Belgaum District Local Board, during the year. With the remaining three machines, 21 bores were taken in Dharwar District. Of these, 16 were surface bores and 5 in existing wells. Out of 16 surface bores, 14 were successful and two failed. Out of 5 well bores, three were successful, one failed and one was incomplete. The total depth bored with the three machines was 2159′ against 3518′ with 5 machines last year. The details of each bore are given in Appendix A.

(42) In addition to the actual boring work above mentioned, 14 pumps were fitted on surface bores. The old bores at Kundgol were cleaned and

pumps repaired. The two machines that were lent to the Belgaum District Local Board were inspected twice and necessary advice was given.

(43) *The work of the Mechanical Assistant.*—He overhauled all the machinery on diferent farms in the Division. He inspected and prepared plans and estimates for 6 pumping schemes. He attended to the repairs and overhauling work of the tractor, belonging to the District Agricultural Association. He erected two pumping plants, one at Sadalga and the other at Borgaon in Chikodi Taluka of the Belgaum District and one power cane crusher at Shirgod in Hangal Taluka of the Dharwar District.

(44) *Karjagi Fodder Storage.*—The bottom layers of stacks built in the open were damaged by white ants and restacking was done during the year on 6" thick beds of sand and coal ashes. The stacks were thatched properly against rains with sugarcane trash and rice straw.

(45) *Tagavi loan applications.*—Besides those for bunding in Bijapur District referred to in paragraph 40 above, takavi loan applications amounting to Rs. 52,050 for land improvement received through Co-operative Societies and Revenue Officers, were dealt with in Dharwar and Belgaum Districts. This work is also increasing.

(*e*) *Agricultural Education.*

(46) The Agricultural School at Devi-hosur completed its 14th year and during this period 147 students have passed out. 17 students in the 1st year, 13 students in the 2nd year and 5 Vernacular teachers received education during the year. Results of examination continued to be good. It is gratifying to note that some of the past students are doing good work on their farms. The Agricultural bias classes are being appreciated by the public and demand for these is increasing. Examinations of all the 13 agricultural bias classes in the Division were conducted by the District staff of the Agriculturl Department. A Vernacular College for training teachers is desirable. Training given at Devihosur is not enough.

(47) *Publications.*—A bulletin No. 140 of 1927 was published on "Tobacco cultivation in the Southern Maratha Country" by Mr. S. S. Salimath, Deputy Director of Agriculture, S. D., Dharwar. Four leaflets were published both in English and Kanarese (1) No. 10 of 1927 "Tobacco as a dry crop in Dharwar District", (2) No. 13 of 1927 "Maize and Tur in the Gokak Canal Tract", (3) No. 15 of 1927 "Cotton as a rotation crop in Gokak Canal Tract", and (4) No. 16 of 1927 "Maize silage in the Gokak Canal area."

(*f*) *General.*

(48) It is pleasing to note that the Departmental work in the Southern Division, especially in the direction of bunding, fencing and spread of improved strains of cotton, groundnut and paddy crops, has been much appreciated by the people. The work is fast extending and I must reiterate here that the staff needs strengthening.

(49) Many Revenue Officers and private gentlemen continued to help our propaganda and organisation work and my thanks are due to them. Among the non-officials, the name of Sardar Chandrappa alias Appasaheb Baswantrao alias Balasheb Naik Bahadur, Desai of Tallur, deserves special mention for the year under report.

(50) Lastly I am glad to make a mention that His Excellency the Governor of Bombay was pleased to grant a visit to the Hubli Co-operative Cotton Sale Society on 11th November 1927. His Excellency took a great interest in the progress of the co-operative sale of cotton and other agricultural improvements in this Division. A special Agricultural Exhibition was arranged on the occasion.

The Honourable Mr. G.B. Pradhan, Minister for Agriculture, Co-operation, Excise, etc., visited this Division in March 1928. He inspected several Farms and Co-operative Institutions, including Taluka Development Associations, and inquired into the needs of the people.

S. S. SALIMATH,
Deputy Director of Agriculture,
Southern Division, Dharwar.

Statement showing particulars of boring work done

Serial No.	Name of owner	Taluka	Village
	District Dharwar		
1	Satyabodhaswami Math	State ..	Savanur ..
2	Mr. Mahamad Husen	Do. ..	Do. ..
3	Khadar Bag	Do. ..	Do. ..
4	Municipality, Savanur	Do. ..	Do. ..
5	Meherban Nababsaheb	Do. ..	Do. ..
6	Savanur State work	Do. ..	Kabntr ..
7	Mr. Shidlingappa	Do. ..	Do. ..
8	Savanur State work	Do. ..	Subargatt ..
9	Mr. Kathote pleader	Do. ..	Savanur ..
10	Rao Bahadur Valvekar	Hubli ..	Hubli ..
11	R. C. Chaplain	Do. ..	Do. ..
12	R. G. Kulkarni	Do. ..	Do. ..
13	Swami Shankaranand	Do. ..	Do ..
14	Mr. Dinshaw	Do. ..	Do. ..
15	Mr. Bassappa Gandroti	Haveri ..	Devihosur ..
16	Rao Bahadur Shetti	Do. ..	Do. ..
17	Mr. Govind Gowda	Gadag ..	Huikoti ..
18	Mr. N. V. Huligol	Do. ..	Kalasapur ..
19	Municipality	Do. ..	Gadag ..
20	Mr. N. V. Huligol	Do. ..	Kalasapur ..
	District Belgaum		
21	Mr. Mahalingappa Kothivale	Chikodi ..	Nipani ..

in Southern Division during the year 1927-28.

Date of starting and completing	Depth bored in in feet	Size of bore	Water before boring	Water after boring
	Ft. In.	Inches		
7th June 1927 .. 4th July 1927 ..	120 6	4	Surface ..	300
9th July 1927 .. 31st July 1927 ..	140 0	4	Do. ..	250
10th August 1927 4th September 1927	110 9	4	Do.	250
6th September 1927. 31st October 1927.	132 0	4	Do.	300
6th November 1927 17th January 1928.	202 0	4	Do. ..	300
23rd January 1928 4th March 1928 ..	150 6	4	Do. ..	300
10th March 1928 .. 3rd April 1928 ..	132 6	4	Do. ..	300
15th April 1928 .. 12th May 1928 ..	175 6	4	Do.	300
17th May 1928 .. 7th June 1928 ..	184 0	4	Do. ..	300
12th June 1927 .. 13th July 1927 ..	150 0	4	Do.	250
18th July 1927 .. 28th August 1927.	184 0	4	Do. ..	200
2nd September 1927. 24th September 1927.	150 0	4	Do. ..	250
15th October 1927 4th January 1928.	158 6	4	Do. ..	300
11th January 1928 16th March 1928..	98 6	4	Well 150 ..	600
6th April 1928 .. 6th May 1928, ..	81 6	4	Surface ..	250
11th May 1928 ..	31 0	4	Well	In
16th June 1927 .. 14th July 1927 ..	71 6	4	Well 100	300
27th July 1927 .. 24th August 1927	19 0	4	Well 150 ..	800
4th September 1927. 23rd November 1927.	84 0	4	Well ntd ..	400
29th November 1927. 30th June 1928 ..	133 10	5	Surface ..	Fail.
22nd May 1927 .. 16th August 1927.	165 6	4	Surface ..	Fail.

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Serial No.	Name of owner	Department charges	Charges for coolies, cartage, etc.
	District Dharwar		
1	Satyabodhaswami Math	187 1 0	68 10 0
2	Mr. Mahamad Husen	250 4 0	59 10 0
3	Khadar Bag	176 3 9	66 6 0
4	Municipality, Savanur	222 8 0	63 10 0
5	Meherban Nababsaheb	278 0 0	121 4 0
6	Savanur State work	200 12 0	73 2 0
7	Mr. Shidlingappa	173 12 0	47 13 0
8	Savanur State work	238 4 0	58 12 0
9	Mr. Kathote pleader	176 0 0	61 8 0
10	Rao Bahadur Valvekar	200 0 0	118 2 0
11	R. C. Chaplain	251 0 0	119 0 0
12	R. G. Kulkarni	216 0 0	78 12 0
13	Swami Shankaranand	266 12 0	143 12 0
14	Mr. Dinshaw	150 13 0	156 4 0
15	Mr. Bassappa Gandroti	99 4 0	89 0 0
16	Rao Bahadur Shettf	Progress	....
17	Mr. Goviand Gowda	82 4 0	55 0 0
18	Mr. N. Y. Huilgol	19 0 0	67 8 0
19	Municipality	48 1 6	147 8 0
20	Mr. N. V. Huilgol	....	....
	District Belgaum		
	Mr. Mahalingappa Kothivale	260 0 0	120 0 0

Cost of fuel, oil, etc.	Casing pipe	Total cost of bore	Cost per foot	Remark
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
59 12 0	Including in Bill.	315 7 0	2 9 0	Successful.
55 0 0	Do. ..	364 14 0	2 10 0	Do.
55 8 0	Do. ..	298 2 0	2 11 0	Do.
59 8 0	Do. ..	345 10 0	2 10 0	Do.
165 15 0	50 0 0	615 3 0	3 1 0	Do.
55 4 0	81 4 0	410 8 0	2 12 0	Do.
34 4 0	81 4 0	337 1 0	2 9 0	Do.
57 9 0	106 4 0	460 13 0	2 10 0	Do.
49 2 0	100 0 0	386 10 0	2 14 0	Do.
65 8 0	167 8 0	551 2 0	3 11 0	Do.
43 4 0	186 4 0	599 8 0	3 4 0	Do.
49 0 0	62 8 0	406 4 0	2 11 0	Do.
58 2 0	145 0 0	613 10 0	3 14 0	Do.
32 15 0	131 0 0	471 0 0	4 12 0	Do.
51 4 0	....	230 8 0	2 15 0	Do.
....	....	....	....	..
50 0 0	....	187 4 0	2 10 0	Successful, completed this year.
58 4 0	....	144 12 0	7 10 0	Cost is higher owing to very hard rock.
134 0 0	6 4 0	335 13 6	4 0 0	
....	....	....	....	Fail.
137 6 0	*Nil.*	517 6 0	3 2 0	Incomplete in last year, completed this year.

APPENDIX F.

Summary of work done by the Deputy Director of Agriculture, Gujarat, Surat, for the year ending 1927-28.

I. Staff.

I was in charge of the Division during the year except for one month and a half on leave from 10th May to 24th June 1928, when Professor B. S. Patel acted for me.

2. Mr. G. P. Pathak continued as Acting Cotton Superintendent, Surat, *vice* Mr. C. S. Patel acting as Deputy Director of Agriculture, Konkan, during the year except for one month from 5th April 1928 to 4th May 1928 when Mr. C. S. Patel reverted as Cotton Superintendent, Surat.

3. The chief characteristic feature of the year, unhappily, was the advent of the unprecedented heavy floods in North Gujarat and North Broach District. The activities of the Agricultural staff had to be diverted to help the cultivators in distress as well as the Relief workers with necessary advice in selection and supply of seeds, growing of suitable crops, supply of implements, etc., in flood-affected areas. The proposed Presidency Agricultural Show had also to be postponed.

II. Research and Experimental Work.

4. This consists of—

(1) Research on crops,

(2) Experimental Station work,

(*a*) Surat Agricultural Station,

(*b*) Broach Farm,

(*c*) Dohad Farm,

(*d*) Amalsad Farm,

(3) Insect and other Crop pests,

and (4) Experimental trials in the District.

(1) *Research on crops.*

5. *Cotton at Surat.*—The segregate 1,027 Surat 5[1] gave 46 lbs. increase in seed cotton per acre which comes to about 7 per cent. Large scale of field trial on 3 acres showed an increase of 33 lbs. per acre which comes to 6 per cent.

Increase in ginning percentage was 1·5 which shows reduction over last year.

In spinning test it is almost equal to 1027 A.L.F. this year though the loss in spinning is more. It is also inferior as far as staple length and fibre strength is concerned.

The same strain tried on the Farm on more than 4 acres gave an increase of only 8 lbs. of seed cotton per acre over 1027 A.L.F. This is hardly 1½ per cent. Its ginning percentage was 33·07 as against 33·8 of 1027 A.L.F. However one more trial will be given.

6. *Cotton at Broach.*—It seems from the report of the Cotton Breeder, that 9¹ is compared with the sample of Local cotton grown on the Farm which is far below the average cotton grown in the District as is shown by low ginning percentage of 32·4 of this year's Local cotton compared with the ginning percentage of 37·7 of the cultivator's sample.

Low ginning percentage of the Local cotton for all these years since 1924 is difficult to explain.

The Local cotton being a very poor sample of cotton is I think absolutely unsuitable for comparison with an improved strain as 9¹ and the results of spinning tests, etc., do not give us any idea as to the superior quality of 9¹ over Local cotton in the District which is to be replaced.

The work of comparative trials of Broach 9¹ with the representative local is reorganised this year with a view to test the real worth of Broach 9¹.

7. *Cotton at Viramgam.*—Although the floods nearly ruined the cotton crop and necessitated repeated sowings, which had a considerable adverse effect on the economic characters, Wagad 4 and Wagad 8 Strains maintained their superiority over the Local, as will be seen from the following :—

Type.	Yield per acre in lbs.		Ginning per cent.	Staple length in inches.	——
	Seed Cotton.	Lint.			
Wagad 4 ..	474	162	34·2	2·08	Premium realised for the improved types was Rs. 15 per candy over the Local.
Wagad 8 ..	483	170	35·3	1·99	
Local ..	457	147	32·2	1·96	

The area under Wagad 4 given out at Bavla, Taluka Dholka, extended to 450 acres, but was reduced to about 300 acres due to floods. The area under Wagad 8 given out round about Viramgam extended to 250 acres, but it was almost ruined. During the current season about 14,000 lbs. of seed of Wagad 4 are distributed to cover about 800 acres.

8. *Jowar at Surat.*—Budh Perio 53 was tried on about 7 acres on the Farm in comparison with Althan Deshi on 8 acres. The former yielded 911 lbs. grain per acre and the latter yielded 792 lbs. Budh Perio was late in flowering and escaped the bad effects of late rains in November ; whilst Althan Deshi 6 was early in flowering and lodged due to rains in November. Budh Perio is to be tried in the District in cultivators' fields.

9. *Rabi Jowar at Broach.*—Ten pure types from selfed heads including 4 new types from cultivators' fields were maintained for further observance. One of these Strain No. 8 yielded 1,220 lbs. of grain and 2,333 lbs. of fodder against 790 lbs. and 1,937 lbs. respectively of the Local per acre.

10. *Tobacco at Nadiad.*—The study and propagation of the selfed seed of the selections of the Local Tobacco varieties were continued. No. 6 continued to maintain the superiority. The policy of its multiplication to meet its increasing demand, as laid down last year met a great hindrance due to heavy and unprecedented rains, and the area under this strain dwindled down from 1,000 acres to 120 acres only. Hence the list of seed-growers was not published. The area of 1¼ acres on the Tobacco Farm gave an yield of about 300 lbs. of seed which is distributed in the District in the current season.

Strain No. 28 also maintained its superiority over the Local Piliu both on the Farm and in the District. It will be multiplied on a small scale.

Other selections were continued and 3 of Belgaum added. Crosses to improve the quality and strength of strain No. 6 are continued. Out of the American types only Adcock will be continued, as others are found defective.

The results of study of manures for Tobacco are published in the Departmental Leaflet No. 9 of 1927.

(2) *Experimental Station work.*

(*a*) Surat Agricultural Station.

11. *Cotton.*—1027 A.L.F. cotton was grown on the whole of the Farm area of 53 acres which gave an average yield of 534 lbs. per acre against 360 lbs. per acre in the surrounding cultivators' fields.

12. *Jowar.*—Area under this crop was 65 acres, average yield of grain per acre on the Farm being 737 lbs. as against 632 lbs. per acre in the surrounding cultivators' fields.

13. *Ridge Experiment No. II.*—This experiment has finished third cycle of Cotton—Jowar rotation and the average result of 6 years shows that simple ridging gives 10 per cent. increase in yield of seed cotton over check plot being sown on flat and receiving ordinary tillage; whilst ridging with deep tillage increased the yield by 18 per cent. over check.

Further application of 10 tons of F.Y.M. every alternate year applied in furrows or trenches increased the yield of seed cotton by 44·9 per cent. over the check.

In case of Jowar the ridge sowing gives 11·8 per cent. increase in grain and 6 per cent. increase in fodder over check plot. Deep tillage with ridges increased the yield by 22·2 per cent. in grain and 9·9 per cent. in fodder over the check plot; whilst 10 tons of manure has shown an increase of 51·7 per cent. in grain and 76·2 per cent. in fodder over the check plot.

14. *Ridge Experiment No. III.*—This is the fifth year of the experiment. The average results of 5 years show that 4 cwts. of Castor cake every year coupled up with sowing on ridges and deep tillage gave an increase of 7·6 per cent. seed cotton over check plot (flat sowing ordinary tillage). If this is compared with Ridge Experiment No. II it shows that ridge sowing and deep tillage gave 18 per cent. increase of seed cotton over check plot; whilst when supplemented with 4 cwts. Castor cake the increase is only 7·6 per cent. Probably there is something in the method of application of Cake that may explain this negative result.

However when 10 tons of F.Y.M. is applied in trenches in alternate years with deep tillage and ridges the increase is 41·9 per cent. over the check which compares favourably with the increase of 44·9 per cent. in Ridge Experiment No. II.

When 4 cwts. of Castor cake is applied every year over and above 10 tons of F.Y.M. every alternate year, the increase in seed cotton is 61·98 per cent. showing that Castor cake when mixed with F.Y.M. helps to increase the yield by about 20 per cent. over the check.

In case of Jowar, 4 cwts. of Castor cake on ridges with deep tillage increased the yield of grain by 24·8 per cent. and fodder by 44 per cent. over the check (flat sowing ordinary tillage). However, if this is compared with Ridge Experiment No. II, we find ridge sowing deep tillage gives increase of 22·2 per cent. in grain and 9·9 per cent. in fodder, so the application of Castor cake increases the grain by about 2 per cent. but helps to increase the fodder by 34 per cent.

Ten tons of F.Y.M. on ridge sowing with deep tillage gives increase of 51·4 per cent. in grain and 69·5 per cent. in fodder, which compares favourably with the results of Ridge Experiment No. II, which shows an increase of 51·7 per cent. in grain and 76·2 per cent. in fodder.

If this 10 tons of F.Y.M. every alternate year and 4 cwts. of Castor cake every year are applied the increase in grain is 67·5 per cent. and the increase in fodder is 100 per cent., *i.e.*, Castor cake increases grain and fodder by about 25 per cent. over the check.

15. *Breeding Herd.*—The Breeding Herd of about 100 Kankrej animals is maintained for more than 25 years with a view to select high milk producers and to supply best pedigree bulls to Surat and Broach Districts to improve Local cattle.

The strength of the Herd on 1st April 1928 was 102 against 90 last year.

The total milk yield was 62,007 lbs. 12 ozs. giving an average of 2,725 lbs. 12 ozs. per animal after excluding the milk of new calves and old cows. Cows from Gopi family continue to be regular and good milkers.

During the year 8 Premium Bulls were distributed into the Surat District, yet it was not possible to meet the full demand.

During the year there was no casualty amongst calves from Protozootic diseases as calves were not allowed to go to water-logged grazing areas.

(*b*) Broach Farm

16. The area reserved for Cotton and Jowar Breeding work is now increased from 6·0 acres to 8·4 acres and the remaining area of 21 acres 11 gunthas of the Broach Farm is leased out to a cultivator for multiplication of the improved Strain.

(*c*) Dohad Farm

17. Selection in Maize and Wheat and distribution of pure seeds through the Garbada Co-operative Society were continued as last year. As Maize is the main crop of the Panch Mahals District and as this District grows the largest area under Maize in the Bombay Presidency, it is time now to put the Maize Breeding work on more Scientific lines by assigning a Breeder to Dohad Farm, as the work of Breeding Maize is rather a complicated one.

18. About 4,000 lbs. of Farm grown pure seed of Spanish Ground-nut was given to the Garbada Co-operative Society, for further multiplication. Cultivation of pure Ground-nut is now a great problem which has engaged the attention of the Department seriously.

19. Varietal Experiments on Paddy re-confirmed Jirasal as the best yielder which gave an outturn of 1,370 lbs. as against Kolamba No. 42 and Sutarsal giving 1,328 lbs. and 853 lbs. respectively per acre. Amongst cultural experiments, inspite of the wet season, Maize sown with a '2' Drill did better. Wheat sown with a Drill 15 " yielded 1,828 lbs. against that sown with a plough 2 ' apart yielding 1,138 lbs. The newly acquired area of 10 acres and 18 gunthas which is mostly brown was levelled up, drained and fenced.

(*d*) Sugarcane Amalsad Farm

20 There was no Red-rot in the tract. Six varieties grown last year were maintained during the year. Besides H. M. 544, D 109, White transparent and S48 were grown on one guntha each to study their suitability. D 109 and White transparent seem promising for the tract. Varieties such as Manjav, Red Sports, Stripped Mauritius, Co.210 and 213 continued to do well in the localities and conditions mentioned in the last year's report.

21. *Ginger and Turmeric.*—Ginger was tried on broad ridge system as compared with bed system on 2 gunthas and the broad ridge system yielded 402 lbs. as against 331½ lbs. on bed system, *i.e.*, 21 per cent. increase. Turmeric on broad ridge system on 2 gunthas yielded 1,424 lbs. as against 1,075 lbs. on bed system, *i.e.*, 32 per cent. increase in yield.

22. *New Crops.*—Progress of introduction of Parwar is hindered by scale insect pest, yet 203 cuttings were distributed to the cultivators.

23. Modified form of Poona Gul Furnace was tried this year with success and a comparative trial will be taken next year. The modification consists of heavy grating to hold heavy fuel. Round about farmers

were loaned implements such as Iron ploughs, Ridger and Scraper. 2 tons of Sulphate of Ammonia were ordered for cultivators for cane and fruits. Planting sets instead of sowing whole canes is getting more popular and more area is planted with sets.

(3) *Insect and other crop-pests*

24. *Jowar Stem Borer Investigation.*—This was continued at Surat, financed from the Sir Sassoon David Trust Fund. The study of growth of Jowar plant from various aspects showed that a dead heart formed by the pests rarely occurs after the plant reaches 1½ feet in height, but due to uneven growth of plants it may be observed even after the crop grows generally higher. Acceleration of growth during the first two months of the crop can lessen the chances of formation of dead heart specially after the crop is thinned.

Further observations and cage experiments are in progress.

25. *Katra (Hairy Caterpillar, Amsacta Mooreii)*:—During the year the emergence of Katra moths was moderate. The mild attack of the pest accompanied by continuous excessive rains could not afford opportunity to confirm the efficacy of the measures in view.

26. *Field Rats.*—These were reported to have assumed a serious form in Godhra and Dholka Talukas. The measures, *viz.*, (1) Baiting of White arsenic powder mixed with cooked flour in proportion of one tola of arsenic to 2 lbs. of flour and (2) fumigation of rat burrows by Cynogas dust 'A' were found useful.

27. *Woolly Mites on Cotton.*—The observations made during the year, conclusively prove that application of sulphur in any form against Woolly Mites on cotton causes shedding of leaves, buds, etc., due to the formation of pentatheonic acid at ordinary temperatures. Further trials with other sprays will be continued.

(4) *Experimental Trials in the District*

28. *Cotton.*—1027 A.L.F. is being introduced in Bulsar and Pardi Talukas for the last 6 years. It yielded there during the year 100 lbs. to 200 lbs. per acre unmanured and in one manured plot at Pardi 575 lbs. as against 500 lbs. of Local per acre.

In Broach District the yield of 9′ cotton was not found favourable as compared with the Local which fetched Rs. 5 to 17 more per bhar than the former due to 36 lbs. more yield per acre and ginning 3 per cent. more. It is decided to limit the trial of 9′ with careful tests.

In North Gujarat Districts 2,690 lbs. of 1027 A.L.F. and 4,600 lbs. of Wagad cotton seeds were distributed, but the trials were hindered due to the floods.

29. *Jowar.*—Budh Perio No. 53 tried in Olpad and Jalalpore Talukas yielded about 4 per cent. to 28 per cent. more than the Local. Its trials are continued for confirmation of the results.

30. *Rice.*—Kolamba 79 tried in Jalalpore Taluka compared favourably with the Local Kada variety, the additional yield of the former varying from 90 to 400 lbs. per acre. Kolamba 42 yielded well at Jetalpur, Taluka South Daskroi, the highest being 4,000 lbs. per acre. This strain is likely to extend there gradually.

31. *Wheat.*—Pusa-4 has now got well established in Dohad and Jhalod. This variety in the irrigated tract of Ahmedabad District is being preferred to the Local Wajia, due to the former's rust-resisting quality. Buxi Wheat also compared well this year with Dhola-katha in retentive and irrigated soil of Jhalod Taluka.

32. *Tobacco.*—385 lbs. of No. 6 were distributed in Kaira District, to cover an area of 800 acres. But due to the floods the area dwindled down to 120 acres. The outturn, however, was better than Local by about 20 per cent. To meet the great increasing demand for this seed and with a view to bring the whole Tobacco area in Kaira District under improved strain, within about 5 years, by annual multiplication, a scheme has been adopted for trial from the current season to give seed free of charge to Tobacco growers on condition to return twice the quantity supplied.

The Anand and Borsad Taluka Development Associations have also taken up the work of multiplication and distribution of this strain No. 6. The Nadiad Agricultural Association too has granted Rs. 300 for this work.

Tobacco seed No. 6 tried at Bavla (taluka Dholka) and in Olpad Broach and Amod talukas also yielded better than the Local.

33. *Groundnut.*—Spanish Peanut and Magadi varieties in Eastern Mahals and Kalol respectively yielded well. The acreage under Groundnut crop reached nearly 80,000 acres during the year in North Gujarat, with 60 Shelling Machines at work.

Spanish Peanut was tried in Bulsar Taluka as a new introduction where it yielded 900 lbs. per acre. If the people of Bulsar and Pardi talukas can get 800 lbs. to 900 lbs. of pods and an equal quantity of fodder, they would be much better off in respect of their waste lands, growing grass and babuls.

34. *Manuring.*—Ammonium sulphate gave very good results on Sugarcane, Ginger, Turmeric and Suran in Surat District, as also Sodium Nitrate and Ammonium sulphate on Tobacco and Rice in Kaira District.

III. Organisation and Propaganda.

(*a*) *Organisation*

35. *Divisional Board.*—The Divisional Board of Agriculture, whose Chairmanship was transferred to the Deputy Director of Agriculture, from 1st November 1927, held three meetings during the year, two of which were accompanied by the Divisional Cotton Committee also. The Propaganda staff almost remained the same as stated in paragraph 34 of the last year's report.

36. *Taluka Development Associations.*—The existing Six Taluka Development Associations in Chorashi, Jalalpore, Pardi, Anand, Borsad and South Daskroi Talukas continued to do good work and were helped and guided by the District Agricultural Overseers concerned. Most of them have maintained Agricultural Graduates which added to the efficiency of work. Formation of new Associations will not be taken up as a general rule, unless localities are found out where Associations can raise funds even without Government subsidy, as Government finances do not permit of greater funds for their expansion.

37. *Agricultural Co-operation.*—The charges of the District Agricultural Overseers and the Agricultural Organiser, Co-operative Societies, N.D., remained the same as stated in paragraph 38 of the last year's report. The Co-operative Milk Society at Napa could not be further organised due to the last floods, though Rs. 1,000 were collected. Through the Garbada Co-operative Society pure seeds of Paddy, Wheat, Groundnut and Maize from the Dohad Farm were distributed to their Members with the help of the Special Mamlatdar, Co-operative Societies, for the Eastern Mahals.

(*b*) *Propaganda*

38. *Cotton Transport Act.*—The question of re-imposing the restrictions relaxed last year with regard to the transport of cotton from the North of the Tapti to its South was hotly discussed in the meetings of the Surat Local Cotton Committee, the Gujarat Divisional Cotton Commitee, the Indian Central Cotton Committee and also in the Bombay Legislative Council. But it seems that the matter will not end satisfactorily unless and until the Co-operative Cotton Sale Societies in Olpad Taluka which only are still going on with their Selection I-A type take it seriously to bring all their cotton area under 1027 A.L.F. in the interest of the whole Cotton Tract.

39. *District Cotton works—Surat Tract.*—Total Kapas obtained from the controlled area of 11,855 acres and 39 gunthas under 1027 A.L.F. cotton was 4,088 bhars 7 maunds and 38 seers which was ginned at 5 centres under Supervision of the Cotton staff. This yielded 1,469 khandis of lint which realised a premium of Rs. 11 to Rs. 35 per khandi. Total seed purchased was 2,249 gallis 12 maunds and 25 seers for which Rs. 1,15,000 were obtained from the Personal Ledger Account of the Director of Agriculture, Bombay Presidency, Poona. The seed was distributed through 9 depots in the tract below the Narbudda and also the demands from the Rajpipla, Chhota Udepur, Radhanpur and Baroda States and the Cotton Sale Societies, Hansot, Hubli, and others were supplied from the Surat, Bardoli and Navsari centres.

Unfortunately, the Bardoli affairs during the last quarter of the year under report involved the Agricultural Department into serious troubles since the attachment of Bardoli Group cultivators' cotton and lint and the recovery of land Revenue Assessment from the sales of these cottons effected by the Revenue authorities made the people most suspicious

about the working of the group system and the Department. There is now a very difficult problem before the Department as to how to regain the confidence of both the cultivators and the merchants and conduct the business as usual without further difficulties.

40. *Broach Tract.*—The results of the Broach Deshi-9[1] cotton distributed last year were unfavourable as against good results of the previous two years and hence it has been decided to watch again this type under very careful tests.

41. *Dholleras (North Gujarat Tract).*—Wagad strain No. 4 in Dholka and No. 8 in Viramgam were distributed on a large scale, but owing to the floods the area was decreased.

42. *Demonstrations and Shows.*—The Presidency Agricultural Show at Ahmedabad which was to be held in December 1927 was postponed for one year, owing to the calamity of the floods. Later on the Executive Committee of the Show which met on 19th March 1928 decided to open the Show from 17th to 28th November 1928. Consequently preparations for the same are rapidly in progress and the activities are brought to the notice of the Public through the Fortnightly Show Gazette started from 25th June 1928.

An Agricultural and Cattle Show was held by the Jalalpore Taluka Development Association which was subsidised by the Department. Besides 27 organised Demonstrations and Shows were held by the District Agricultural Overseers, during the year.

IV. Service.

43. *Implement and Seed Depots.*—The six Depots were continued. Total hire charges earned by them were Rs. 50-14-0 as against Rs. 77-14-0 of last year.

44. *Distribution of Seeds.*—In all about 1,49,672 lbs. of seeds were distributed (excluding those by the Surat Cotton Staff); important of which were 40,100 lbs. of Sundhia Jowar in Kaira; 20,154 lbs. of Maize and 23,520 lbs. of Wheat seed in Panch Mahals; 10,732 lbs. of Gram seed and 4,736 lbs. of Groundnut in Panch Mahals and Ahmedabad; and 3,692 lbs. of Kolamba paddy in Surat and Ahmedabad districts. 1,380 Fruit plants were distributed in Kaira and Ahmedabad districts.

45. *Implements.*—In all 54 implements worth Rs. 900 were distributed, excluding 29 ploughs and harrows worth Rs. 300 supplied to the cultivators in flood affected areas in Broach District.

46. *Manures.*—About 46 tons and 12½ cwts. in all were distributed, including 20 tons and 8 cwts. of Ammonium Sulphate, 2½ tons of Sodium Nitrate and 20 tons and 2½ cwts. of denatured salt.

47. *Coppersulphate and Poison Packets.*—6,368 packets of coppersulphate were distributed for prevention of smut in Jowar and 1,779 packets for destruction of Pig and Jackals. Out of the reported 59 baits eaten by animals, 31 Jackals were located dead. As a result of distribution of 356 packets of White arsenic for destruction of rats that did havoc

in the villages of Salia Group (Panch Mahals District) nearly 300 acres under Gram and Wheat crops were saved.

48. *Fruit Culture.*—With the help of an expert mali sent by the Horticulturist from Poona, budding of bores and grafting of mangoes were done to a great extent in Chorashi and Jalalpore talukas where the people were very keen.

A Horticultural Class was held at Pardi in March 1928 under the auspices of the Pardi Taluka Development Association, of which people took advantage.

49. *Boring.*—Due to heavy rains the demand for boring was less and particularly nil in the Panch Mahals District. The Boring Machine working there was therefore transferred to the Surat District. Out of 40 bores in all undertaken during the year, 26 bores or 66 per cent. were successful, 13 failure and one left incomplete. (*Vide* detailed statement attached.) The total depth bored was 2,338′-10″ and the total quantity of water tapped was 25,075 gallons per hour. The failure was due to insufficiency of water in two cases; saltish water tapped in 5 cases; hard rock preventing any further progress in 4 cases; tapping of water being found hopeless at 154′ depth in one case and the last one having to be abandoned owing to an accident that could not be recovered inspite of all possible trials. Only two accidents occurred during the year but the other was successfully recovered. Out of the 7 Machines working in this Division, Machine No. 14 continue to work in the Jalalpore Taluka in consultation with the President of the Taluka Development Association. It made 12 bores in the taluka, of which only one was unsuccessful. In Olpad Taluka 6 bores were made for drinking purposes at the instance of the Collector of Surat and the District Local Board. But all except one got saltish water.

The total expenditure including permanent Boring Establishment during the year amounted to Rs. 15,293-5-3. Total recoveries of Boring charges were Rs. 2,395-15-4 those in arrears being Rs. 5,319-12-10.

50. *Mechanical Help.*—The Mechanical Assistant got 49 enquiries including 5 pending of last year. Of these 40 were attended, 4 filed and 5 remained in arrears. These included 25, 8, 6, 4 and 2 from Surat, Broach, Kaira, Panch Mahals and Ahmedabad respectively and 4 from the Baroda State territory. In all 67 works were executed by him of which 24 belonged to Government, 39 to individual cultivators, 2 to Co-operative Societies, 1 to Local Board and 1 to the Arts College, Surat. He was out on tour for 155 days during the year, out of which he spent 38 days in executing Government works and 117 for cultivators. There was no occasion to call him for the same work a second time and hence no fees were charged for the help to the cultivators during the year.

V. Agricultural Education.

51. *The Vernacular Agricultural Schools at Godhra and Surat* (started in 1920 and 1923 respectively) opened their classes with 22 and 30 students respectively. The number of applicants seeking

admission to these schools was 45 and 34, of which 13 and 16 respectively were admitted in the first year. All the students appeared at the Annual Examination held in April 1928 and the number passed in the first and second year at Godhra was 9 and 7 and at Surat 14 and 12 respectively.

The total expenditure of the Godhra and Surat Schools during the year was Rs. 8,790-14-0 and Rs. 10,317-2-8 and receipts Rs. 429-0-10 and Rs. 523-3-6 respectively excluding the contributions from the District Local Boards which amounted to Rs. 100 and Rs. 900 respectively and which were credited into Government Treasury as Departmental Receipts. Besides the usual contribution of Rs. 500 from the Sir Sassoon David Trust Fund was also received by each of the Schools towards maintenance of the students, the amount in the case of Godhra being actually utilized in the School expenditure and that of Surat being credited into Government Treasury as Departmental Receipts.

The average feeding expenses per boy per month to Government was Rs. 9-4-6 and Rs. 9-8-0 respectively at Godhra and Surat and that of the whole Institution Rs. 31 and Rs. 32 respectively.

The students of the Dharala Boarding adjoining the Godhra School were given training in agriculture as usual. From this year the Agricultural Bias Class course is introduced in the Dharala School, so that from the next year the practice will discontinue.

VI. Publications.

52. The Publication of the Broach quarterly Magazine was continued besides publishing articles on agricultural matters in Local papers amongst which the Gujarat Mitra and Gujarat Darpan of Surat rendered a very good service. In all 36 articles were published by the Agricultural staff of this Division. The Departmental Publications for which material was supplied by the Officers from this Division during the year were :—

Leaflet No. 9 of 1927.—Results of Manurial Experiments on Tobacco at Nadiad.

Leaflet No. 14 of 1927.—The North-West Locust.

53. As a measure for encouragement of vernacular literature on Agricultural matters a Committee has been appointed by Government as per Government Resolution No. 791, Educational Department, dated 11th May 1928, to select authors for composing such books. I thank the Educational Department for appointing me as one of its members and I hope the work will be soon taken up.

54. *Radio Talks.*—These are now found to be one of the efficient means of giving publicity and there was a series of such talks on Agricultural matters in the weekly programme at Bombay where I delivered a talk on "Taluka Development Associations in Gujarat" on 11th February 1928. It aroused much curiosity amongst the Public as a result of which a Taluka Development Association is being formed at Tadkeshwar in Mandvi Taluka.

VII. Flood Relief.

55. Three supervising Officers with 22 Graduate Assistants were engaged for one month and a half for Kharif and one Supervising Officer with 11 Graduate Assistants worked for 2 months for Rabi Agricultural relief in North Gujarat. These included some staff from other Divisions, specially deputed for flood relief, *viz.*, Mr. C. S. Patel, Acting Deputy Director of Agriculture, Konkan, who supervised the operations in Kaira District and Messrs. H. M. Desai and C. N. Dave of the Poona Agricultural College Staff, all of whom rendered their valuable services. Out of 588 affected villages, 161 were visited by the staff in Kharif and 82 villages in the Rabi season, in rendering help to Local Samitis in procuring reliable and suitable seeds and helping the cultivators in growing suitable crops, etc.

VIII. Conclusion.

56. The work done by the staff under me was on the whole very satisfactory and especially by those engaged in the Flood Relief Operations, as well as in making preparations for the Presidency Agricultural Show at Ahmedabad.

BHIMBHAI M.,
Deputy Director of Agriculture,
Gujarat, Ahmedabad.

Shahibagh, Ahmedabad,
25th September 1928.

Statement of Bores undertaken in Gujarat
(Referred to in paragraph 49 of

Serial No.	Name of well or landowner.	Taluka.	Village.
	Bores left incomplete last year and completed in this year.		
	Ahmedabad District.		
16	Vallabhbhai Shivabhai ..	N. Daskroi ..	Gota ..
	Surat District.		
27	Govind Hari Bhana	Bulsar ..	Mograwadi ..
	Surat District.		
	New Bores in 1927-28.		
1	Ashmailji Abhramji	Chikhli ..	Alipor ..
2	Do.	Do. ..	Do. ..
3	Khandubhai Gopalji	Jalalpur ..	Onchi ..
4	Local Board Trial Bore	Olpad ..	Delasa ..

Division during the year 1927-28.

the Summary for Gujarat.)

Date of commencement.	Date of completion.	Actual number of working days.	Reasons of stoppages.	Survey No.
16th May 1927	10th December 1927.	38	4 Erections and fitting	....
			13 Accidents	
			2 For labourers	
			139 For rains	
			4 For pipes	
			5 For test	
			2 For Dismantling ..	
			3 For engine trial	
29th May 1927	29th December 1927.	34	2 Earth work	....
			8 Erection and fitting ..	
			5 Tempering Tools	
			2 Dismantling	
			3 Labour	
			6 Pipes	
			8 Repairs	
			8 Koses	
			15 Instruction	
			124 Rainy season	
1st October 1927	9th November 1927.	7	4 For erection	....
			26 For pipes	
			2 Withdrawing pipes ..	
			1 For Dismantling ..	
15th November 1927.	10th December 1927.	18	4 Erection	....
			2 Test	
			1 Dismantling	
			1 Withdrawing pipes ..	
3rd December 1927.	16th December 1927.	5	4 For Erection	....
			1 For Dismantling ..	
			4 For Test	
27th November 1927,	23rd January 1928.	18	2 Earth work	....
			3 Erection	
			2 Dismantling	
			25 Instructions not received from Board.	
			2 Withdrawing pipes ..	
			2 Holidays	
			3 Materials	
			1 Test	

Serial No.	Name of well or landowner.	Particulars as to the commencement of Bores.	Total Depth of Boring.	Diameters of Bores.
		Feet	Feet	Inches
	Ahmedabad District.			
16	Vallabhbhai Shivabhai	57	144 Last year 108 36 This year	4 2½
	Surat District.			
27	Govind Hari Bhana	51	154 40 last year 114 This year.	6
	Surat District.			
	New Bores in 1927-28.			
1	Ashmalji Abhramji	67	42	4
2	Do.	67	66	6 reduced to 4
3	Khandubhai Gopalji	30	36	4
4	Local Board Trial Bore	Surface 12 ft. pit.	136	4

Footage of pipes used.	Cutting Shoe.	Water before working in Gallons per hour.	Water level before boring.	Water after boring in Gallons per hour.	Water level after boring.	Increase of water supply in gallons per hour.
Feet	Number		Feet		Feet	
112 32	1 1	3,000	30	6,000	30	3,000
....	1	1,000	22	1,000	22	....
....	....	1,000	45	1,000	45	....
6" 23'-7" 4" 145'-0"	....	1,000	45	1,000	45	....
36	1	250	5	1,000	5	750
....	....	....	....	....	....	....

Serial No.	Name of well or landowner.	Numbers of strata met with.	Flat charges.	Cost of pipes and Shoes.
		Gallons	Rs. a. p.	Rs. a. p.
	Ahmedabad District.			
16	Vallabhbhai Shivabhai	4	191 0 0	185 0 0
	Surat District.			
27	Govind Hari Bhana	2	....	25 0 0
	Surat District.			
	New Bores in 1927-28.			
1	Ashmalji Abhramji	2	....	....
2	Do.	3	....	168 8 0
3	Khandubhai Gopalji	2	36 0 0	59 0 0
4	Local Board Trial Bore	3	....	....

Labour charges	Cost of fuel Lubricant, etc.	Total cost.	Cost per foot.	Results.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
232 12 0	57 12 0	666 8 0	4 7 7	Successful.
100 0 0	50 0 0	175 0 0	1 2 2	Failure abandoned with no hope of success.
39 8 0	24 8 0	64 0 0	1 8 5	Failure as tool cannot work further.
48 12 0	23 0 0	240 4 0	3 10 3	Failure as water is below level.
15 0 0	9 0 0	119 0 0	3 4 11	Successful.
127 8 0	47 0 0	174 8 0	1 3 0	Failure as Saltish water tapped.

Serial No.	Name of well or landowner.	Taluka.	Village.
	Surat District—contd.		
5	Khandubhai Gopalji	Jalalpur ..	Ouchi ..
6	Govindbhai Naranbhai Patel	Do. ..	Munsad ..
7	Manibhai Gopalji	Chikhli ..	Pipalgabhan ..
8	Govindbhai Naranbhai and others	Jalalpur ..	Munsad ..
9	Parbhu Morar	Do. ..	Do. ..
10	Khandubhai Akhubhai	Pardi ..	Palsana ..
11	Trial Bore (L.B.)	Olpad ..	Bhagwa ..
12	Gokalbhai Khusalbhai and Premabhai Govindbhai.	Jalalpore ..	Munsad ..
13	Trial Bore (L.B.)	Olpad ..	Mirjapore ..
14	Naranbhai Morar Patel	Jalalpore ..	Munsad ..
15	Nagar Soma Patel (L. B. well)	Do. ..	Do. ..

Date of commencement.	Date of completion.	Actual number of working days.	Reasons of stoppages.	Survey No.
18th December 1927.	26th December 1927.	4	3 For erection .. .. 1 For test .. .. 1 For dismantling	....
29th December 1927.	6th January 1928.	4	4 For erection .. .. 2 For test .. .. 1 For dismantling	....
5th January 1928	14th March 1928	24	9 Earth work and erection .. 1 Labour .. .. 12 Materials .. .. 12 Repairs .. 7 Engine cleaning and Holiday .. 5 Withdrawing pipes	....
14th January 1928.	22nd January 1928	5	2 Erection .. .. 1 Test .. .. 1 Dismantling	....
24th January 1928.	6th February 1928.	9	3 Erection .. .. 1 Test .. .. 1 Dismantling	....
29th January 1928.	8th June 1928 ..	18	3 Erection .. .. 2 Cleaning of engines .. .. 10 B. M. on leave .. .. 10 Well owner busy and so unable to arrange labourers. 89 Accidents	....
28th January 1928.	11th February 1928.	5	5 Erection .. .. 1 Cleaning of engine .. .. 2 Withdrawing pipes .. .. 2 Dismantling	21
8th February 1928.	19th February 1928.	8	2 Erection .. .. 1 Test .. .. 1 Dismantling	....
14th February 1928.	23rd February 1928.	5	3 Erection .. .. 2 Labourers	324
21st February 1928.	1st March 1928.	6	2 Erection .. .. 1 Test .. .. 1 Dismantling	....
3rd March 1928.	14th March 1928.	6	2 Erection .. .. 3 Labourers .. .. 1 Dismantling	....

Serial No.	Name of well or landowner.	Particulars as to the commencement of bores.	Total depth of boring	Diameters of bores.
	Surat District—contd.	Feet	Feet	Inches
5	Khandubhai Gopalji	78	32	4
6	Govindbhai Naranbhai Patel	78	18	4
7	Manibhai Gopalji	42	58	4½ reduced to 3
8	Govindbhai Naranbhai and others	75	36	4
9	Parbhu Morar	45	60	4
10	Khandubhai Akhubhai	40	75	6
11	Trial Bore (L. B.)	Surface	40	4
12	Gokalbhai Khusalbhai and Premabhai Govindbhai ..	40	60	4
13	Trial Bore (L. B.)	18	27	4
14	Naranbhai Morar Patel	40	60	4
15	Nagar Soma Patel (L. B. well)	72	38	4

Footage of pipes used.	Cutting Shoe.	Water before working in gallons per hour.	Water level before boring.	Water after boring in gallons per hour.	Water level after boring.	Increase of water supply in gallons per hour.
Feet	Number		Feet		Feet	
27	1	500	65	1,500	55	1,000
18	1	1,000	60	3,000	60	2,000
36	2 4½" and 3" one each	250	13	250	13	....
36	1	500	50	1,500	50	1,000
60	1	500	22	300 from sweet Bore.	22	300
....	.....	200	20	200	20	Nil.
....	.....	....	....	....	....	....
60	1	500 saltish.	22	300 sweet.	22	300
27	....	125	1	1,125	6	1,000
60	1	500 saltish.	16	300 sweet.	16	300
33	1	500	42	2,500	44	2,000

Serial No.	Name of well or landowner.	Numbers of strata met with.	Flat charges.	Cost of pipes and shoes.
	Surat District—contd.		Rs. a. p.	Rs. a. p.
5	Khandubhai Gopalji	2	32 0 0	47 12 0
6	Govindbhai Naranbhai Patel	2	18 0 0	36 8 0
7	Manibhai Gopalji	3	....	69 0 0
8	Govindbhai Naranbhai and others	2	36 0 0	59 0 0
9	Parbhu Morar	2	65 0 0	89 0 0
10	Khandubhai Akhubhai	1	....	....
11	Trial Bore (L. B.)	....	....	....
12	Gokalbhai Khusalbhai and Pemabhai Govindbhai ..	2	65 0 0	89 0 0
13	Trial Bore (L.B.)	2	27 0 0	34 12 0
14	Naranbhai Morar Patel	2	65 0 0	89 0 0
15	Nagar Soma Patel (L. B. well)	2	33 0 0	55 4 0

Labour charges.	Cost of fuel Lubricant, etc.	Total cost.	Cost per foot.	Results.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
25 0 0	7 4 0	111 4 0	3 7 8	Successful.
25 0 0	10 0 0	89 8 0	4 15 7	Do.
73 8 0	34 6 0	176 14 0	3 0 9	Tool could not work further.
33 12 0	8 8 0	137 4 0	3 13 0	Successful.
32 8 0	12 14 0	199 6 0	3 5 2	Do.
100 0 0	30 0 0	130 0 0	1 11 9	Failure due to accidents not removed.
85 0 0	33 4 0	118 4 0	2 15 0	Failure as saltish water tapped.
24 0 0	17 12 0	195 12 0	3 4 2	Successful.
36 0 0	11 4 0	109 0 0	4 0 7	Do.
20 0 0	17 12 0	191 12 0	3 2 5	Do.
37 8 0	15 12 0	141 8 0	4 4 7	Do.

Serial No.	Name of well or landowner.	Taluka.	Village.
	Surat District—contd.		
16	Manibhai Gopalji	Chikhli ..	Pipalgabhan ..
17	Trial Bore (L. B.)	Olpad ..	Mirjapur ..
18	Kana Bhavan	Jalalpore ..	Munsad ..
19	Khandubhai Gopalji	Do. ..	Onchi ..
20	Local Board well	Olpad ..	Kadrama ..
21	Patel Govind Naran	Jalalpore ..	Munsad ..
22	Sarvajanik well (L. B.)	Olpad ..	Mohmedpuro ..
23	Bai Dhani, guardian of Mohan Daji	Jalalpore ..	Munsad ..
24	Manibhai Gopalji	Chikhli ..	Pipalgabhan ..
	Ahmedabad District.		
1	Local Board well	Sanand ..	Amadnagar ..

Date of commencement.	Date of Completion.	Actual number of working days.	Reasons of stoppages.	Survey No.
15th March 1928	25th April 1928	22	2 Earth mark 4 Erection 7 B. M. on leave 4 Labourers 1 Test 2 Dismantling 4 Erection	....
17th March 1928	26th March 1928.	4	1 Test 1 Dismantling 2 Erection	324
16th March 1928	28th March 1928.	10	1 Dismantling 3 Erection	....
3rd April 1928 ..	15th April 1928 .	9	1 Test and Dismantling	....
5th April 1928 ..	16th April 1928 .	8	3 Erection 4 Labourers 1 Test 1 Dismantling	....
16th April 1928.	28th April 1928.	7	3 Erection 1 Dismantling	....
19th April 1928.	31st May 1928 .	25	3 Erection 2 Accident 6 Petrol 2 Kerosene 1 Dismantling 4 Labourers	....
2nd May 1928 ..	22nd May 1928 .	8	3 Erection 7 For pump 1 For pump fitting 1 For Test 1 For dismantling	....
8th May 1928 ..	10th June 1928 .	22	2 Erection 8 Labourers 2 Dismantling	....
22nd November 1927.	13th February 1928.	26	3 Erections 7 Repairs 22 Engine Repairs 9 Test 13 For orders and instructions from L. B. 2 Dismantling 2 Labourers	....

Serial No.	Name of well or landowner.	Particulars as to the commencement of Bores.	Total depth of boring.	Diameters of Bores.
	Surat District—contd.	Feet.	Feet.	Inches.
16	Manibhai Gopalji	42	56-6	6
17	Trial Bore (L.B.)	18	42	4
18	Kana Bhavan	40	72	4
19	Khandubhai Gopalji	36	78	4
20	Local Board well	25	15	4
21	Patel Govind Naran	40	63	4
22	Sarvajanik well (L. B.)	38	71	4
23	Bai Dhani, guardian of Mohan Daji	30	60	4
24	Manibhai Gopalji	42	59-4	4
	Ahmedabad District.			
1	Local Board well	38	113	3

Footage of pipes used.	Cutting Shoe.	Water before working in gallons per hour.	Water level before boring.	Water after boring in gallons per hour.	Water level after boring.	Increase of water supply in gallons per hour.
Feet	Inches		Feet		Feet	
38	1	225	8	250	7	25
....	....	1,125	6	1,125	6	Saltish water.
72	1	500 Saltish.	7	300 Sweet.	5	300
78	1	750	4	750	4	Bore water 8 feet below bottom.
....	....	250	8	250	8	....
68	1	500 Saltish.	12	800 Sweet.	12	300
82	1	500 About.	7	500	7	....
80	1	500 Saltish.	7	800	7	300 Sweet.
....	....	250	7	250	7	....
118	1	500	4	1,000	5	500

Serial No.	Name of well or landowner.	Numbers of strata met with.	Flat charges.	Cost of pipes and shoes.
	Surat District—contd.		Rs. a. p.	Rs. a. p.
16	Manibhai Gopalji	3	....	148 8 0
17	Trial Bore (L. B.)	2	....	....
18	Kana Bhavan	2	83 0 0	104 0 0
19	Khandubhai Gopalji	2	....	87 0 0
20	Local Board well	2	....	....
21	Patel Govind Naray	2	69 8 0	92 12 0
22	Sarvajanik well (L. B.)	4	....	116 8 0
23	Bai Dhani, guardian of Mohan Daji	2	65 0 0	89 0 0
24	Manibhai Gopalji	2	....	....
	Ahmedabad District.			
1	Local Board well	5	144 8 0	130 0 0

Labour charges.	Cost of fuel Lubricant, etc.	Total cost.	Cost per foot.	Results.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
67 8 0	44 8 0	260 8 0	4 9 9	Failure owing to hard rock.
15 0 0	10 0 0	25 0 0	0 9 6	Failure saltish water tapped.
28 0 0	23 6 0	238 6 0	3 5 0	Successful.
37 8 0	24 0 0	148 8 0	1 14 6	Failure as bore water below bottom of well.
12 0 0	9 0 0	21 0 0	1 6 5	Failure as saltish water tapped.
22 0 0	21 0 0	205 4 0	3 4 1	Successful.
33 0 0	50 10 0	250 2 0	3 8 4	Failure saltish water tapped.
28 0 0	19 8 0	201 8 0	3 5 9	Successful.
70 0 0	45 0 0	115 0 0	1 15 0	Failure due to hard rock.
200 0 0	39 4 0	513 12 0	4 8 9	Successful.

Serial No.	Name of well or Landowner.	Taluka.	Village.
	Ahmedabad District—contd.		
2	Dahyabhai Nathubhai	N. Daskroi ..	Tragad ..
3	Vaghela Gavjibhai Baijibhai	Sanand ..	Vasna ..
4	Udesing Surabhai and Sahebji Dewising ..	Do. ..	Do. ..
5	Mulusing Dansing and Ladhubhai Madarsing ..	Do. ..	Vasna Iava ..
6	Keshrising Gulabsing	Do. ..	Do. ..
7	Jhala Nathubhai Bajibhai	Viramgam ..	Abhesang para ..
8	Kisabhai Samalbhai	Sanand ..	Rupavati ..
	Broach District.		
1	Vallabhbhai Narsibhai	Ankleshwar ..	Ankleshwar ..
2	Govindlal Trambaklal	Do. ..	Kansia ..
3	Do. ..	Do. ..	Do. ..

Date of commencement.	Date of completion.	Actual number of working days.	Reasons of stoppages.	Survey No.
....	....	....	....	....
17th February 1928.	8th March 1928.	10	2 Erections .. .. 5 Repairs .. .. 2 Labourers .. .. 2 Dismantling	....
10th March 1928.	25th March 1928.	8	5 Earth work .. .. 2 Erections .. .. 1 Test and Dismantling .	....
26th March 1928.	4th April 1928 ..	4	3 Erection and fitting .. 1 Test and Dismantling ..	....
9th April 1928 ..	19th April 1928.	6	2 Erections .. .. 2 Test .. .. 1 Dismantling	....
24th April 1928.	31st May 1928 ..	22	4 Earth work and erection .. 6 B. M. on leave .. .. 4 Materials .. .. 1 Test .. .. 1 Dismantling	....
7th June 1928 ..	21st June 1928..	12	2 Erection .. .. 1 Dismantling	....
20th December 1927.	30th January 1928.	19	4 Erection and fitting.. .. 3 Labourers .. .. 2 Koses .. .. 3 Dismantling .. .. 10 Tools and pipe cutter ..	....
10th February 1928.	28th February 1928.	8	1 Pit made .. .. 4 Erections fitting .. .. 4 Test .. .. 2 Dismantling	....
1st March 1928..	22nd March 1928.	8	5 Erections fitting .. .. 3 Labourers .. .. 1 Test of Engine .. .. 1 Pit .. .. 1 Test .. .. 1 Dismantling	....

Serial No.	Name of well or landowner.	Particulars as to the Commencement of Bores.	Total depth of boring.	Diameters of bores.
	Ahmedabad District—contd.	Feet	Feet	Inches
2	Dahyabhai Nathubhai	....	....	....
3	Vaghela Ganjibhai Bhaijibhai	Surface bore	56	3
4	Udesing Surabhai Sahebji and Devising ..	29	35	3
5	Mulusing Dansing and Ladhubhai Madarsing ..	34	36	3
6	Keshrising Gulabsing	34	35	3
7	Jhala Nathubhai Bajibhai	Surface bore	65	3
8	Kisabhai Samalbhai	26	57	3
	Broach District.			
1	Vallabhbhai Narsibhai	36	97	4
2	Govindlal Trambaklal	Surface bore 15' pit.	36	4
3	Do.	Surface bore 18' pit.	32	4

Footage of pipes used.	Cutting shoe.	Water before working in gallons per hour.	Water level before boring.	Water after boring in gallons per hour.	Water level after boring	Increase of water supply in gallons per hour.
Feet	Number		Feet		Feet	
....	....	....	....	....	....	.....
56	1	....	Surface bore.	500	39 Water in bore.	500
35	1	1,000 Saltish.	11	2,000	11	1,000 Sweet.
36	1	2,000	14	4,000	14	2,000
35	1	1,000 Saltish.	14	5,000	14	4,000 Sweet.
50	1	....	....	500 Sweet.	10 Below surface.	500 Sweet.
57	1	1,000	13	2,000	13	1,000
87	1	The well could be emptied in 2 hours.	23	500	26	500
40	1	....	....	500	Water in bore hole.	500
40	1	....	....	500	Do.	500

Serial No.	Name of well or landowner.	Numbers of strata met with.	Flat charges.	Cost of pipes and shoes.
	Ahmedabad District—contd.	Gallons	Rs. a. p.	Rs. a. p.
2	Dahyabhai Nathubhai	....	....	....
3	Vaghela Ganjibhai Bhaijibhai	2	59 0 0	73 0 0
4	Udesing Surabhai Sahebji and Devising ..	4	35 0 0	52 0 0
5	Mulusing Dansing and Ladhubhai Madarsing ..	2	36 0 0	53 0 0
6	Keshrising Gulabsing	2	35 0 0	52 0 0
7	Jhala Nathubhai Bajibhai	2	72 8 0	67 0 0
8	Kisabhai Samalbhai	2	60 8 0	74 0 0
	Broach District.			
1	Vallabhbhai Narsibhai	3	120 8 0	122 12 0
2	Govindlal Trambaklal	3	36 0 0	64 0 0
3	Do.	3	32 0 0	64 0 0

Labour charges.	Cost of fuels Imbricant, etc.	Total cost.	Cost per foot.	Results.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
....	....	....	....	In progress.
40 0 0	11 4 0	183 4 0	3 4 4	Successful.
25 0 0	12 4 0	124 4 0	3 8 10	Do.
26 0 0	0 4 0	134 4 0	3 12 8	Do.
30 0 0	13 12 0	130 12 0	3 11 9	Do.
90 0 0	27 8 0	257 0 0	3 15 3	Do.
45 0 0	17 4 0	196 12 0	3 7 3	Do.
62 0 0	32 4 0	237 8 0	3 7 3	Do.
39 0 0	18 8 0	157 8 0	4 6 0	Do.
48 0 0	18 8 0	162 8 0	5 1 3	Do.

Serial No.	Name of well or landowner.	Taluka.	Village.
	Broach District—contd.		
4	Govindlal Trambaklal ..	Ankleshwar ..	Khanpda ..
5	Do.	Do. ..	Do. ..
6	Do.	Do. ..	Do. ..

Date of commencement.	Date of completion.	Actual number of working days.	Reasons of stoppages.	Survey No.
27th March 1928.	11th April 1928.	9	3 Erection and earth work	....
			3 Test	
			1 Dismantling	
13th April 1928.	30th April 1928.	12	2 Erection	....
			2 Labourers	
			1 Test	
			2 Dismantling	
22nd May 1928.	14th June 1928.	14	3 Erection	....
			4 Pipes threading	
			2 Coal	
			1 Dismantling	

Serial No.	Name of well or landowner.	Particulars as to the commencement of Bores.	Total depth of boring.	Diameters of bores.
	Broach District—contd.	Feet.	Feet.	Inches
4	Govindlal Trambaklal	Surface bore	48	4
5	Do.	Do.	48	4
6	Do.	Do.	50	4

Footage of pipes used.	Cutting shoe.	Water before working in gallons per hour.	Water level before boring.	Water after boring in gallons per hour.	Water level after boring.	Increase of water supply in gallons per hour.
Feet	Number					
49	1	....	....	500	Water in bore hole.	500
48	1	....	....	500	Do.	500
50	1	....	....	500	Do.	500

Serial No.	Name of well or landowner.	Numbers of strata met with.	Flat charges.	Cost of pipes and shoes.
	Broach District—contd.	Gallons	Rs. a. p.	Rs. a. p.
4	Govindlal Trambaklal	2	48 0 0	74 0 0
5	Do.	2	48 0 0	74 0 0
6	Do.	2	50 0 0	76 8 0

Labour charges.	Cost of fuel lubricant, etc.	Total cost.	Cost per foot.	Results.
Rs. a. p.	Rs. a. p.	Rs. a. p.		
35 0 0	25 12 0	182 12 0	3 12 11	Successful.
40 0 0	21 12 0	183 12 0	3 13 3	Do.
50 0 0	24 0 0	200 8 0	4 0 2	Do.

BHIMBHAI M.,
Deputy Director of Agriculture,
Gujarat.

APPENDIX G

Summary of work done under the Deputy Director of Agriculture, Konkan Division, Ratnagiri, during the year 1927-28.

I. Staff.

I was in charge of the Division except from 5th December 1927 to 6th May 1928, when Mr. V. G. Gokhale, the permanent incumbent of the post held charge.

2. The superior subordinate staff consisted of 16 Graduate Assistants of which 9 were working in Research and Experiment, 6 for extension and propaganda in the districts and 1 for agricultural education.

II. Season.

3. In the South Konkan regular monsoon commenced in the third week of May and extended into North Konkan by 2nd week of June. The sowing and transplanting operations were in time. The rice crop on the whole was normal; but late rains in October and November damaged the rice crop which was either harvested or standing in the field. Rabi sowings were delayed due to heavy rains in October and November and consequently the yields were low.

4. There were no pests of a serious nature affecting rice crop except in Kanara district where "Kanne" fly pest appeared in Kumta and Honavar Talukas in August and did some damage to the growing crop. The second flowering of mango was badly attacked by *Jassid* hoppers and mildew which reduced the crop yield by 40 to 50 per cent. The *Koleroga* disease on *supari* was not serious during this year as in the past.

III. Research and Experiment.

(1) *Rice.*

5. *Rice breeding and selection.*—This work was continued on the Ratnagiri Farm as in the past year. Among the early group of rices, the strain No. 25 white grained and No. 42 red grained mentioned in paragraph 8 of the last year's report were tried on cultivators' fields at Deogad and Malvan and they gave an increase of yield varying from 25 to 50 per cent. At Ratnagiri and Sakharpa they gave an increase of yield from 10 to 25 per cent. They appear suitable for many parts of the Ratnagiri District and extensive trials are arranged in the next season.

6. As Ratnagiri was not suitable for late rices a plot was taken on lease at Sakharpa about 30 miles East of Ratnagiri where late rices are grown. All intermediate and late strains were grown there and the results show that Nos. 59 and 61 mentioned in paragraph 9 of the last year's report gave higher yields as compared with the local. On

cultivators' fields at Dapoli these strains also did well and after further examination it is proposed to grow them on a large scale.

7. Some of the late strains were tried at Kumta as in last years; but none of them proved useful and it has been observed that there is no possibility of any of the strains selected at Ratnagiri being suitable for Kanara. So it is proposed to carry on breeding work at the Kumta Farm from the local materials in future.

8. The borer resistant strains did well this year and in fact the incidence of attack was less in some of them than that in the checks; but it is not possible to say whether the attack was less due to inherited resistance or different periodicity of the breeds of the pest. With a view to see whether varieties with a hard cuticle and slight leafiness can successfully withstand the borer attack, a number of such strains were obtained from United Provinces, Madras and Burma, as mentioned in paragraph 11 of last year's report; but they also were attacked by the borer and consequently proved of no use.

9. Karjat Kolamba No. 79 was distributed to cultivators in the district. It gave comparatively better yields but complaints were received from the people that this paddy was badly attacked by pests in storage. Due to this trouble its popularity is decreasing. Karjat Kolamba No. 164 was tried during the year at Sakharpa and Dapoli. It did not give any advantage at Sakharpa while at Dapoli it gave an increase of yield from 20 to 46 per cent.

10. *Rice Research at Karjat.*—The work at Karjat was carried on as in the past years. As mentioned in paragraph 5 of last year's report the chief aim has been to determine the ways which would increase the size of the earhead of the rice plant ultimately leading to a greater yield per acre with more economic advantages to the grower. All the past experiments lead to the fact that increase in the yield of rice can be effected by producing the maximum number of earheads with the maximum size possible in a given area; and the past work has shown that it is possible to produce 10 lacs of earheads in an acre and the biggest size of a single earhead ever achieved has been 0·5 of a tola. However, it is found that under equal conditions of fertility the size of the earhead decreases almost exactly in the inverse proportion of the number of earheads. But the experiments show that this proportion can be improved by the use of fertilisers, such as Ammonium sulphate, green manure, etc.; and under Karjat conditions it has been found that 60 lbs. of Nitrogen in the form of Ammonium Sulphate produces the optimum results giving on an average 6,90,000 earheads per acre of an average size of 2·5 grams per head leading to 3,800 lbs. per acre.

11. The results of other researches at Karjat can be summarised as under:—

(*a*) This year's results show that the statement made in paragraph 5 (*e*) of last year's report, is not conclusive. The results obtained during the year under report show that the size of the earhead does not depend upon the form of nitrogen whether organic or inorganic

but seems more to depend on the availability of nitrogen with increased nitrogen—the size is appreciably increased.

(*b*) To see the effects of puddling on water requirements of the rice plant, an experiment was laid out in the glass house in triplicate in pots which received water at intervals of 24, 72 and 144 hours in puddled and unpuddled conditions. The results obtained show that puddling reduces the water requirements considerably.

(*c*) In order to find out the loss of nitrogen by drainage, over-flow of water and recovery in crop, an experiment was laid out in pots and the results by actual analysis show that 44 per cent. of the total nitrogen applied was recovered in the form of extra total dry matter over no manure and about 7 to 8 per cent. was lost by drainage and over-flow which means that about 48 per cent. of the nitrogen applied was unaccountable. This seems to be due to the loss of nitrogen in some gaseous form. On an examination of the past data it appears that the recovery of nitrogen in the form of extra grain and straw has been between 16 and 25 per cent. when the nitrogen was applied at the rate of 60 lbs. per acre. These investigations are in progress with a view whether the loss in nitrogen can be minimised and economy in manuring can be affected.

12. *Manurial experiments on rice at Karjat.*—Sulphate of Ammonia was tried in different doses of 200, 300, 400 and 500 lbs. per acre and the results show that 300 lbs. is the most economic dose under Karjat conditions and the effect of this dose is materially improved if it is applied in two or three fractions. The increase by this application comes to 20 per cent. more than on the no manure plot and leaves a profit of Rs. 22 per acre.

13. Green manuring with 13,400 lbs. of *Calatropis Gigantea* leaves and 5,400 lbs. of *Ipomea* leaves both equal to 60 lbs. nitrogen per acre gave an increase of 48 and 23 per cent. respectively over the no manure plot. From a practical point of view there is little chance of growing *Calatropis* economically but it is possible to grow the *Ipomea* in the rice fields after harvest of rice crop and it is worth studying this problem from a practical and economic point of view.

14. Ammo-phos and calcium cyanamide were compared with sulphate of ammonia and the results show that under Karjat conditions Ammonium sulphate is the most effective and economic. It is not worth trying again these manures.

15. *Manurial experiments on rice at Kumta.*—Ammo-phos at Kumta at the rate of 2 cwts. per acre gave an increase of 50 to 70 per cent. over the farm yard manure plot and it is conclusively proved that this manure is very effective on laterite soils. It is further proposed to try it on the Kumta Farm from an economic point of view. Calcium Cyanamide was tried both at Kumta and Ratnagiri in comparison with Ammonium sulphate but the results were in favour of Ammonium sulphate.

16. The various experiments in the field and in pots carried on at Kumta show that the Kumta soils are distinctly acidic and the behaviour

of different manures varies with the degree of acidity and drainage conditions. Under springy conditions bonemeal alone continues to give the best results, while on high lying areas ammonium sulphate gives good results both alone and in combination with farmyard manure. The soils being acidic, also lime alone at the rate of two tons per acre has given good results and the residual effect of this application is also appreciable.

(2) *Nagli.*

17. *Nagli Breeding.*—This work was continued at Hatkhamba as in previous years and strain Nos. A 16 and E 5 continue to be the best. These are late types and suitable for tracts where late types are grown. Strain Nos. B 11, E 31 and E 82 are the best among early types and these were distributed to cultivators who reported favourably for them.

18. *Manurial experiments on Nagli.*—As reported in para 16 of the last year's report the manurial experiments on *Nagli* were continued during the year under report and the results show that Ammonium sulphate and bonemeal can be profitably used in place of fish manure. The plots at Hatkhamba were shown to the cultivators of round about and many of them have gone in for these manures.

(3) *Sugarcane.*

19. *Manurial experiments.*—Addition of 2 cwts. of bonemeal per acre to the usual dose of farmyard manure has been now conclusively proved beneficial at Kumta and no further experimenting on this is now necessary there. The work on sugarcane will now only be limited to the introduction of new varieties at Kumta.

(4) *Cocoanut.*

20. *Manurial experiments.*—The manurial mixture consisting of 4 lbs. of bonemeal, 4 lbs. of oil cake, 1 lb. of potash sulphate and 1 lb. of common salt as reported in para 19 of the last year 's report was tried during the year under report and the results obtained show that on an average 70 nuts per tree were obtained from the manured trees as compared with 52 nuts from the unmanured ones. The average number of female flowers on the manured trees was 156 while that on the unmanured was 183; but the number of nuts harvested from the manured trees was 70 while that from the unmanured trees was 52 as reported above. This shows that though the female flowers were less on manured plants, the number of nuts harvested was more by about 34 per cent. It is difficult to explain why there were less female flowers on the manured trees.

21. The various methods tried to improve the old cocoanut gardens reported in para 20 of the last year's report were continued and the results were as under :—

(*a*) Tying of cattle at different places in the garden in fair season did not give any advantage in the yield of nuts though the trees showed marked difference in vegetative growth.

(*b*) Application of 2 lbs. of common salt gave 21 nuts per tree while the untreated gave 17 nuts per tree. The garden was not irrigated during the year and consequently there was a drop in new bunches.

(*c*) The digging of the soil in November gave on an average 20 nuts per tree, while the untreated gave 15 nuts. This simple treatment gives good advantage and is worth trying further.

22. The question of the dropping of immature nuts was further studied during the year under report and the observations show that neither spraying with Bordeaux mixture nor watering had any material advantage; but from the records of manured and unmanured plants it appears that manuring checks the dropping of nuts to a certain extent.

23. Observations made on the suitability of nuts for seed purposes harvested at different periods show that the nuts harvested in March are the best for seed purposes and seedlings raised from these nuts are better in stand. The best age to transplant the cocoanut seedlings is after three months from the date of germination and seedlings raised in the open are more vigorous than those under shade.

24. The cocoanut varieties received from the Federated Malay States and Cochin were badly attacked by rhinoceros beetle and consequently, the plants did not make any progress. During the year the *Banavli* variety from Goa was obtained and is planted in the nursery.

(5) *Mango.*

25. The study of mango flower-heads and the effect of spraying and dusting to check the blighting effects of *jassid* hoppers and mildew was continued during the year. The mango flower-head is composed of two types of flowers, *viz.*, the male or stamminate and the complete or hermaphrodite. The proportion of complete flowers is very low and varies from flush to flush and tree to tree. Again the larger the number of total flowers in a head, the smaller the proportion of complete flowers. From observations made during the year it is found that if the total number of flowers in a head is 8,000 the percentage of complete flowers is 3·25; but if the total number is smaller, the percentage is larger upto 10·65 per cent. in a flower-head containing 2,000 flowers. Of this small percentage of complete flowers nearly 99 per cent. are lost in shedding either unfertilised or immature fruits and only one per cent. of the complete flowers bears fruits.

26. Spraying with Bordeaux mixture and fish oil rosin soap and dusting with sulphur and calcium cyanide were tried against hoppers and mildew and the results of the various treatments were interesting. It appears that sulphur and cyanide dusting is very effective and it is hoped to get practical results after some further trials.

During the year under report spraying with Bordeaux mixture gave an increase of 156 per cent. while with fish oil rosin soap it was 30 per cent. Dusting with sulphur gave an increase of 113 per cent. while dusting with a mixture of sulphur and calcium cyanide in the proportion of 3 : 1

gave an increase of 250 per cent. The above spraying and dusting were made in the second flush when hoppers and mildew were present; but it was interesting to note that these treatments gave increased outturns, even there were no hoppers or mildew in the first flush; probably in the latter case the treatment acted as a preventive against hoppers and mildew.

(6) *Forest growing.*

27. As mentioned in para 22 of last year 's report the work of trying suitable plants for deforested areas was in progress at Kumta and observations so far made indicate that amongst the tree species *Cassia Siamea, Ficus retusa* and *Hardwickia binata* appear to be the most promising; and amongst the bushes *Adhatod Vasica, Dodania viscosa, Teprosia candida, Grewia microcoa* and *Ipomea carnia* appear to be promising.

(7) *Synthetic manure.*

28. The experiments of rotting the various kinds of leaves and trash as mentioned in para 23 of last year's report were continued at Kumta and the observations made show that higher percentages of nitrogen in the form of Ammonium sulphate than 0·3 per cent. of the dry matter does not help much in rotting ordinary dry leaves. Lower quantity of nitrogen at the rate of 0·1 per cent. does equally well but it takes a little longer time to rot.

29. It was also observed that 5 per cent. of lime alone added to the dry trash brings about the same degree of breaking up as 0·3 per cent. of nitrogen in the form of Ammonium sulphate in the course of three months.

30. If the dung and urine of a bullock which on an average amount to 9 lbs. and 6 lbs. respectively are daily mixed with 40 lbs. of dry leaves and allowed to rot, the resulting material is somewhat better than that obtained with 0·3 per cent. of nitrogen in the form of Ammonium sulphate.

31. The rotting in a shaded manure pit was found better than in an open pit, due to higher temperature and greater moisture in the shaded pit. Stirring the manure heaps every eight days considerably improved the quality of the manure by breaking up pieces of dung and obtaining a homogeneity.

32. Very fibrous materials such as betelnut husk, rice husk, etc., decomposed as successfully as ordinary dry leaves, but the percentage of nitrogen required to rot such materials was 0·6 per cent. of the dry matter.

(8) *Onion Leaf Blight.*

33. This disease is under study at Kumta since last four years, but unfortunately all remedies against it have proved fruitless. Five hundred and fifty-seven bulbs selected last year for blight resistance were tried during the year but none of them proved entirely blight

resistant; but there was some difference in the degree of attack and further trials are to be continued. Among the different varieties tried it was observed that Alibag white and Goa red are more resistant than others; but these are poor yielders as compared with others.

(9) *Rice land crabs.*

34. Extensive trials with two fumigants namely carbon bi-sulphide and calcium cyanide were arranged during the year. The dose used in the case of carbon bi-sulphide was 0·7 gram and 1/12 of an ounce in the case of calcium cyanide. But it was observed that crabs were not killed by the fumigants with the doses used. Similarly it was also observed that the area treated last year was not free from crabs. So it has been proposed to find out the effective dose which will kill the crabs and then to try it on an extensive scale to see if it can be used in a practical and economic way.

(10) *Garden crop pests.*

35. The following garden pests were studied during the year:—

(1) *Crocido-lomia binotalis.*—This caterpillar feeds upon young shoots of cabbage soon after transplanting; it was found to be attacked by a hymenopterous parasite and checked considerably.

(2) *Flea beetles.*—These are found on young cabbage seedlings and it was found that they can be controlled by applying a sticky mixture.

(3) *Prodenia litma.*—This pest attacks lucerne crop. No effective remedy was found.

(4) *Rhizoctonia.*—This fungoid pest attacks chillies, brinjals and tomatoes. As a remedy, corrosive sublimate 1 oz. in 15 gallons of water was applied and it was found that plants thus treated did not suffer.

IV. Propaganda.

36. The principal items of the programme of the district staff were as under:—

(1) Introduction of improved and high yielding rices. As in the past years the operations for the distribution of Kolamba No. 42 were principally carried out in Kolaba and South Thana tracts. The total quantity of seed distributed was 1,25,000 lbs. which was sufficient to cover 3,500 acres under fresh seed; seed distribution work is carried on in these areas for the last five years and it has spread over almost all the suitable areas in these districts. All the distribution work was to be done on credit as the cultivators are mostly tenants having no ready cash on hand. In future it is now proposed to give first-hand seed from the Karjat Farm to selected landlords who will undertake to distribute the resulting seed to their tenants or others. Every year these seed growers will be changed so that fresh seed will be available in all localities turn by turn.

Kolamba No. 79 has been found suitable for high lying areas in Ratnagiri and Thana districts and nearly 11,700 lbs. of this seed sufficient

to cover 300 acres was distributed departmentally. As reported in paragraph 9 above, this paddy is more susceptible to attack by store pests and consequently its spread will be limited. *Maskti* and *Halga* varieties of paddy continued to be popular in the Kanara district and they have now spread over almost all suitable areas there; the district staff arranged to supply fresh seed for about 200 acres from selected growers.

In North Thana district Strain No. 35 tried during the year has been found suitable except in Wada Taluka and arrangements are made to grow it on a large area in the ensuing season. Strain No. 226 has been found useful in Wada taluka and it is being distributed there.

(2) *Improved Nagli strains.*—700 lbs. of improved *nagli* seed was distributed in the Ratnagiri, Kolaba and Thana districts and the reports received indicate that strain Nos. E 31 and E 82 gave higher yield in the Ratnagiri district while in Kolaba and Thana they were found rather too early. Late strains will be tried there next year.

(3) *Introduction of other new crops and varieties.*—A new variety of sugarcane namely H. M. 544 was tried at Siddapur in Kanara district and this has been found a good yielder. It is being further propagated. The old varieties Red Mauritious, Manjav, and Barbodose are now fast replacing the local in this district. The onion crop introduced in Kanara and Ratnagiri is doing fairly well except in Kanara where it is attackd by leaf blight and consequently does not increase in area rapidly. Tobacco is also being tried in some places and the Agricultural Overseer, Kolaba, reports that it was grown successfully at Roha in Kolaba district. The other introductions namely sweet potatoes, groundnut and tapioca are making progress wherever the soils are found suitable.

(4) *Manures.*—The use of Ammonium sulphate as a partial substitute for rab is gaining ground and the district staff reports that nearly 5 tons of this manure was used for this purpose in the Kolaba and Thana districts. The Agricultural Overseer, Kolaba, made experiments with this manure on fields of rice crop and from the results it was found to be useful only on heavy black soil areas where an extra yield of 4 mds. of rice per acre was obtained after deducting the price of the manure which was applied at the rate of 2 cwts per acre. In salt and ill-drained soils, it did not give any material increase. This manure is being taken up now for garden crops and during the year nearly 32 tons was supplied through the Department. Similarly bonemeal, superphosphate, dried blood, etc., to the extent of 18 tons were distributed by the district staff.

(5) *Implements and machinery.*—The Poona boiling pans and iron mills are fastly spreading in the Kanara district and the old *Dotte* is also being replaced by the wooden Persian wheel. In the Thana district the iron Bulsar rahat is getting popular and during the year the district staff in all distributed 14 iron mills, 20 Poona pans, 21 Persian wheels, 12 Bulsar rahats, 8 sprayers and 73 Meston ploughs.

In North Thana coastal region where underground water has been successfully tapped by boring, power pumping plants are being erected and during the year 3 such pumping plants were installed. A power

crusher was erected at Killar in Siddapur taluka of the Kanara district and was successfully worked by an enterprising cultivator.

(6) *Koleroga spraying.*—This is not yet getting popular due to the difficulty of getting climbers in June and July when the spraying work is to be done. Again there is some prejudice also amongst the gardeners against this practice. So a party of leading gardeners from Siddapur, Sirsi and Honavar talukas was taken round to Sagar in the neighbouring Mysore State where spraying is in vogue. The people were satisfied with what they saw and it is hoped that they will take to it systematically. Only 95 acres of gardens were sprayed during the year as against 200 acres last year.

(7) *Breeding bulls.*—Three Surti buffalo bulls were maintained at Ratnagiri, Hatkhamba and Kumta and in all they served 214 buffaloes. The Sindhi bull at Kumta proved of no use and arrangements are being made to return it to the Poona College Dairy. The Live Stock Expert to Government gave one premium bull in the village of Killar in Siddapur taluka. The bull is an Amrit Mahal cross breed and served 24 cows during the year.

(8) *Denaturalised salt.*—During the year licenses for 3,707 maunds of the material were issued as against 5,049 maunds in the past year.

(9) *Crop tests.*—The propaganda staff and other graduate assistants took 13 crop tests—10 on rice, one *nagli*, *harik* and sugarcane each.

(10) *Gul making.*—The gul prepared in the Ratnagiri district turns blackish in colour in a few days after manufacture. To see whether this can be prevented, demonstrations with the Poona method of gul making were carried out in Kanara and Ratnagiri districts where the gul was manufactured by a special *gulva* from Poona. But it was found that the colour of the gul did not improve and it turned blackish as usual. It appears this is due to the climatic and soil conditions where sugarcane is grown. However, it served one useful purpose in the Kanara district where some people took to preparing solid gul instead of liquid which is the current method in vogue there.

(11) *Eradication of lantana and mimosa pudica.*—In some parts of Kanara these plants have been a serious pest and they are fast spreading in all open areas. The Agricultural Overseer, Kanara, carried out some experiments in eradicating *mimosa* and it was found that it can be killed by spraying with arsenic solution at a cost of rupee one per guntha; but this can be done only in enclosed gardens and cultivated areas; for, the open areas it is problematical. This can be done to a certain extent if the village people work communally and cut the plants before they seed for two or three years continuously. The material will serve as a very good manure when rotten. Similarly with *lantana* it was found that it can be rotted by the addition of lime and converted into good compost manure and the best way to eradicate it is to collect before seeding and convert it into manure.

(12) *Tractor demonstration.*—Some of the salt lands in Kolaba district are badly infected with a weed called *"Bobadi"* and it can be eradicated

only by hand-digging with considerable labour. So a tractor demonstration was arranged by Messrs. Ahmuty & Co. of Bombay, at Panwel where Cletrac K. Model was worked. The work was efficient and it was found suitable for the purpose. The cost of ploughing came to Rs. 8-2-0 per acre including depreciation charges.

(13) *Shows and demonstrations.*—A large show was organised at Roha in Kolaba district under the auspices of the local Taluka Development Association. Mr. Hanmante, the Agricultural Overseer, Kolaba, worked as General Secretary of the show. The show was a success and was attended by nearly 40,000 people. The Agricultural Overseer, Kanara and North Thana arranged five small shows at different places in the districts in connection with local fairs. The staff arranged 249 demonstrations on cultivators' fields for manurial and varietal trials and demonstrations of improved implements such as ploughs, harrows, rahats, etc.

(14) *Protection of crops from wild animals.*—The twelve guns given to professional shikaries by the Department for pig hunting in the Honavar taluka were in use there. They killed more pigs than private licensees; but the villagers do not help them adequately. Three retainers for elephant shooting were maintained at Honavar, Sirsi and Siddapur but they could not kill any elephants during the year as there were no suitable cartridges. Arrangements are being made to procure suitable cartridges from England.

(15) *Publications.*—The monthly magazine in Marathi namely "Konkan Sheti Samachar" was discontinued during the year due to financial deficits and instead, it was arranged that the Konkan staff should contribute to the "Shetki and Shetkari" edited at the Poona Agricultural College under the auspices of the Deccan Agricultural Association and 292 copies were allotted for distribution in this division. The Konkan staff contributed 105 articles on agricultural topics for this magazine. The following leaflets were published during the year :—

Leaflet No. 2 of 1927. List of implements recommended by the Agricultural Department for Konkan Division. (Thana, Kolaba, Ratnagiri and Kanara districts.)

Leaflet No. 19 of 1927. Sulphate of ammonia as a field manure for rice crop.

Leaflet No. 22 of 1927. More economic water lifts for the Konkan.

Leaflet No. 27 of 1927. Some useful types of paddy for the Kanara district.

Bulletin No. 141 of 1927. Trees and shrubs for producing green manure in the Konkan and North Kanara.

V. Organization.

37. *Divisional Board of Agriculture.*—During the year there were four meetings of the Board at two of which the Deputy Director of Agriculture was the Chairman and at the other two, the Assistant Registrar, Co-operative Societies, Bombay Division, presided. It controlled

and directed the work of the propaganda staff of the Agricultural and Co-operative Departments and Taluka Development Associations as usual.

38. *Taluka Development Associations.*—There were ten registered Associations during the year as under :—

Thana district :—Mahim, Kalyan, Umbergaon and Dahanu.
Kolaba district :—Roha.
Ratnagiri district :—Dapoli, Ratnagiri and Rajapur.
Kanara district :—Sirsi and Karwar.

Of these the Roha and Dahanu Associations were registered during the year. The Alibag Association could not be revived and the registration has been cancelled. The work of the Ratnagiri Association went down during the year for want of funds. The Karwar Association which was also dwindling has been revised by the efforts of the Mamlatdar Mr. Subhayat.

39. *Co-ordination of Revenue and Agricultural Departments.*—During the year 4 co-ordination meetings were arranged at Alibag, Karwar, Thana and Ratnagiri under the presidentship of the Collectors of the districts at which members of the District Local Boards were invited. At these meetings the programme of work of the Agricultural Department was explained and discussed and the help of the Revenue officers was requested where necessary and it is gratifying to note the interest taken by the Revenue Officers in the Agricultural development of the country. The district propaganda staff met all the Mamlatdars and laid down simple schemes of demonstrations in the different talukas.

40. *Non-credit co-operative work.*—There were 23 non-credit societies in the Division and the propaganda staff helped in their work wherever required. There was no special development during the year except that a co-operative Forest Growing Society is under formation in the Ratnagiri district.

VI. Agricultural Education.

41. *Vernacular Agricultural School at Jambul.*—This school continued to work as in the past. There were 13 students in the first year and 10 students in the second year. The result of the annual examination held in April 1928 was as under :—

Class	No. of boys who appeared at the examination	No. of boys who passed in the examination
1st year	13	8
2nd year	10	10

VII. Well Boring.

42. There were seven machines in the division, one of which is a Calyx drill and the remaining six Musto patent machines worked by oil engines. The total amount of footage bored during the year was 2,866 feet as against 1,972 of last year. The total number of bores made was

34 out of which 20 were successful, 6 unsuccessful, 2 abandoned at owners' request and 6 incomplete. The outturn of work was good as compared with that of last year.

The statement of detailed information regarding boring work is appended separately.

43. *Personal.*—The staff worked efficiently to the best of their ability and put in good work during the year. There was no important change except that Mr. G. C. A'more, Boring Assistant, was dismissed from service and Mr. Limaye, second clerk in the office of the Deputy Director of Agriculture, Konkan, appointed to act in his place.

C. S. PATEL,
Deputy Director of Agriculture,
Konkan Division.

Annual Report of Boring Work done in the Konkan

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore		Water before boring in gallons per hour
	THANA DISTRICT.			Inches	Ft.	in.	
	Machine No. 2, Calyx Drill.						
1	The Honorary Secretary, Gowrakshaka Mandal, Kandivali.	S. Salsette ..	Kandivali ..	5	200	0	Surface ..
2	Do. ..	Do. ..	Do. ..	5	192	0	Do. ..
3	Do. ..	Do. ..	Do. ..	5	60	0	Do. ..
4	Do. ..	Do. ..	Do. ..	5	200	0	Do. ..
	Machine No. 16, Musto Power.						
5	Mr. Bahiram Zack ..	Dahanu ..	Gholwad ..	4	54	0	....
6	Do. ..	Do. ..	Do. ..	4	75	6	....
7	Do. ..	Do. ..	Do. ..	4	55	0	....
8	Mr. Lallubhai Kastulal Shah.	Do. ..	Nagankas ..	4	36	0	....
9	Do. ..	Do. ..	Do. ..	4	18	0	....
10	Mr. Mahadeo Laxman Raut.	Do. ..	Do. ..	4	110	0	....
11	Do. ..	Do. ..	Do. ..	4	35	0	....
12	Do. ..	Do. ..	Aswali ..	4	35	6	....
	Machine No. 46, Musto Power.						
13	Mr. Raghunath Raoji Dandekar.	Palghar ..	Palghar ..	4	143	0	Surface ..
14	Do. ..	Do. ..	Do. ..	4	72	0	Do. ..
15	Mr. Krishnaji Keshav Patil.	Do. ..	Do. ..	4	46	0	1,500 ..

Division during the year 1927-28 ending 30th June 1928.

Water after boring in gallons per hour	Departmental charges	Labour charges, etc.	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
No water	90 15 0	200 0 0	290 15 0	1 7 2	Unsuccessful.	The machine was being overhauled and repaired for over six months from October 1927 to March 1928 and hence the output is poor.
250	308 0 6	172 8 0	481 1 6	2 6 0	Successful.	
250	90 10 6	120 13 0	211 7 6	3 8 3	Do.	
No water	Not yet billed as the bore has not been tested by a Myer's pump.				Unsuccessful.	
....	61 13 0	....	61 13 0	1 2 4	Successful.	The strata at the foot of the hills where the machine was shifted being very hard and detention of the machine for about four months owing to repairs resulted in a poor output of work by this machine.
....	92 14 0	....	92 14 0	1 3 6	Do.	
....	71 12 0	36 8 0	108 4 0	2 15 5	Do.	
....	61 12 0	81 1 0	142 13 0	3 15 10	Do.	
....	43 0 0	49 0 0	92 0 0	5 1 9	Do.	
....	23 4 9	111 13 0	135 1 9	1 3 7	Unsuccessful.	
....	43 12 3	63 8 0	107 4 3	3 1 0	Stopped at the owner's request.	
....	....	....	....	....	In hand.	
250	205 12 0	255 2 0	460 14 0	3 3 6	Successful.	The strata at and round about Palghar being rather hard and the machine being idle for over five months for repairs to the engine and machine and waste of a jar the output of work by this machine is poor.
250	88 4 0	58 4 0	146 8 0	2 0 6	Do.	
2,000	46 0 0	....	46 0 0	1 0 0	Do.	

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore		Water before boring in gallons per hour
				Inches	Ft.	In	
	THANA DISTRICT —*contd.*						
	Machine No. 46, Musto Power—contd.						
16	Mr. Ramchandra Dhondo Dalvi.	Palghar ..	Varkunti ..	4	60	0	500
	Machine No. 15, Musto Power.						
17	Mr. D. S. Dandekar ..	S. Salsette. ..	Borivali ..	4	103	6	No water ..
	KOLABA DISTRICT.						
	Machine No. 6, Musto Power.						
18	Mr. Narayan Martand Dharkar.	Pen ..	Nehed ..	4	87	0	Surface ..
19	Mr. B. G. Bartakke ..	Roha ..	Kille ..	4	75	0	Do. ..
20	Mr. G. C. Bhate ..	Do. ..	Roha ..	4	136	0	No water ..
21	Mr. M. R. Penkar ..	Pen ..	Pen ..	4	19	0	Surface ..
	RATNAGIRI DISTRICT.						
22	Mr. C. K. Salgaonkar.	Dapoli ..	Dapoli ..	4	30	0	....
23	Mr. R. K. Khot ..	Do. ..	Do. ..	4	35	0	....
24	Mr. J. M. Karnik ..	Do. ..	Do. ..	4	130	0	No water ..
25	Mr. G. K. Patankar ..	Chiploon ..	Chiploon ..	4	35	0	Do. ..

Water after boring in gallons per hour	Departmental charges	Labour charges, etc.	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
....	....	....	....	..	In hand.	
....	....	....	....	..	In hand.	The strata on Borivali side is very hard causing two accidents which took about four months to remove. About four months more were spent for want of a 4" jar and hence the work is extremely poor.
160	106 4 3	90 0 0	196 4 3	2 4 0	Abandoned at owner's request.	From July to November no one took the machine owing to rains. About three months more were spent in removing two accidents and for want of rope, pipes, etc. The strata round about Pen where the machine was working for *most of* the year is very hard. Hence the output is very poor.
250	73 4 0	25 15 0	99 3 0	1 5 3	Successful.	
No water ..	7 0 6	....	7 0 6	0 0 10	Unsuccessful.	
....	....	....	....	..	In hand.	
....	57 3 0	66 4 0	123 12 0	4 2 0	Successful.	Owing to no transport facilities in monsoon for supply of material from Palghar to Dapoli where the machine was working, it was idle for about four months and about two months more were spent in negotiations with applicants.
....	56 3 0	....	56 3 0	1 9 6	Do.	
No water ..	68 9 0	....	68 9 0	0 3 4	Unsuccessful.	
....	....	....	....	....	In hand.	The strata also is very hard. Hence the output is very poor.

Serial No.	Name of the land-owner	Taluka	Village	Diameter of bore	Depth of bore		Water before boring in gallons per hour
				Inches	Ft.	in.	
	KANARA DISTRICT.						
26	The President, Taluka Development Association, Sirsi.	Sirsi ..	Sirsi ..	4	177	10	Surface ..
27	The President, Sirsi Municipality.	Do. ..	Do. ..	4	119	8	Do. ..
28	Do. ..	Do. ..	Do. ..	4	137	4	Do. ..
29	Mr. Chanbasappa Gauda F. Heggodmanne.	Siddapur ..	Heggodmanne ..	4	70	0	....
	THANA DISTRICT.						
	Tripod Borings.						
1	Mr. Raghunath Raoji Dandekar.	Palghar ..	Palghar ..	3	45	0	Surface ..
2	Mr. Navroji Bapuji Tuchekra.	Do. ..	Shirgaon ..	3	41	0	1,500
3	Do. ..	Do. ..	Do. ..	3	44	0	1,500
4	The Sub-Divisional Officer, Public Works Department.	Do. ..	Surya river ..	3	40	0	In river ..
5	Do. ..	Umbergaon ..	Dhirja river ..	3	132	0	Do. ..
6	Mr. Jagannath Vishnu Dandekar.	Palghar ..	Padghe ..	4	12	0	1,800
	KOLABA DISTRICT.						
7	Mr. N. R. Pense ..	Roha ..	Roha ..	4	5	0	No water ..

Water after boring in gallons per hour	Departmental charges	Labour charges, etc.	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
250	78 12 0	298 2 0	376 14 0	2 2 0	Successful.	In Kanara also the transport facilities in monsoon being very inconvenient for supply of material, the machine was idle for about 4½ months and about 4½ months more for want of labour and material and illness of mechanic. The machine worked only for about three months. The strata in the upghats is very soft. The output of work is very good.
250	213 4 9	131 10 0	344 14 9	2 15 8	Do.	
250	225 12 6	....	225 12 6	1 10 3	Do.	
250	99 8 0	113 8 0	213 0 0	3 0 8	Do.	
500	15 0 0	135 0 0	150 0 0	3 5 4	Successful.	
1,800	20 8 0	160 0 0	180 8 0	4 8 0	Do.	The work by Tripod is very good as it was done in favourable localities.
1,800	22 0 0	150 0 0	172 0 0	4 0 0	Do.	
Not known	13 5 4 44 0 0	160 0 0	113 5 4	2 13 4	Bores taken for the purposes of foundations.	
....	....	....	....	....	In hand.	
No water	2 8 0	15 0 0	17 8 0	3 8 0	Unsuccessful.	

APPENDIX H.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, SIND, DURING THE YEAR 1927-28.

Organization and Finance.—The present staff of the Department, excluding that engaged on post Barrage problems at Sakrand consists of—

1 Deputy Director of Agriculture—I.A.S.
1 Divisional Superintendent of Agriculture.—B.P.S.
1 Cotton Breeder—B.P.S.
14 Graduate Assistants of Upper Subordinate Service
20 Non-Graduate Assistants of Lower Subordinate Service
7 Clerks, Ministerial Service
6 Mechanical Assistants including a fitter and 4 engine drivers.

2. I continued to be in charge of the Division throughout the year.

The post of the Divisional Superintendent of Agriculture vacated by Mr. Jafferali on 12th April 1927 has been filled by Mr. Lokeram, as a temporary measure, from 4th October 1927.

Mr. Mahomed Umar Barakzai relinquished charge of the Fruit Farm Mirpurkhas on 9th April 1928 and proceeded to Sakrand Research Station on deputation. His place has been filled by Mr. S. R. Gandhi with the designation as Horticulturist.

In the Mechanical Branch Mr. R. M. Tambe was promoted temporarily to the post of Assistant Agricultural Engineer from 1st September 1927 and Mr. T. P. Gulrajani appointed to take his place as the Mechanical Assistant.

3. The following table shows the expenditure incurred on the Department and receipts realized during the year 1927-28 :—

Year	Staff	Expenditure Contingencies	Receipts
1927-28	88,406	84,348	42,118

Season.

4. *Inundation.*—The inundation of the river Indus on which Sind agriculture mainly depends was both late and short. The inundation period was further characterised by the river keeping abnormally low throughout. Later it abruptly fell far too below the level necessary for keeping the canals flowing. This state of affairs brought about reduction in the area under Kharif crops specially cotton and rice. These crops were however replaced to some extent by *bajri, jowari* and *til.*

Bosi wheat areas in North Sind were also affected for want of sufficient water to enable them to be flooded at the usual time.

5. *Rainfall.*—This is normally very small in Sind but the rainfall of the year in the south-east strip covering Mirpurkhas division of Thar Parkar district and Tando division of Hyderabad district was unparalleled in the living memory. The total fall reached the figure of 32 inches in the short spell of 3 or 4 days. This heavy downpour caused destruction of crops, buildings and live stock. Advantage was however taken by the people of the moisture left in the soil by rain by growing jambho and rape seeds. The crop grew well and would have given a normal outturn, had it not been hit by a severe frost of about a week's duration.

6. *Crop pests and diseases.*—Locust made their appearance touching practically all the parts of Sind as in the past year and did some damage. Rice crop suffered severely from rust and smut diseases in almost all the rice growing tracts except the Nara Valley and from grass hoppers in Sukkur District. Rats also did damage to this crop.

7. *Fodder supply.*—This was sufficient except in certain parts of the Indus delta and the south of Hyderabad where the cattle refused to eat the only available rice straw of the diseased crop.

8. *Agricultural labour.*—This was on the whole sufficient although the wages ruled high.

9. *General.*—Taking all things together the year can not be said to be one of the average prosperity for the agriculturist and this was specially the case in lower Sind where great damage to crops, live-stock and the residential buildings was caused by torrential rains. Relief was however afforded by the liberal grants of taccavi loans by Government and charity by private collections to agriculturists in the affected areas for replacing the live-stock and reconstructing their dwellings.

Nawabshah District not only escaped the destructive floods but fared exceptionally well in as much as its cotton crop was much above the average of the last 4 or 5 years.

Research and Investigation.

10. This work may be divided into two parts :—

(*a*) Prospective work with special reference to conditions which will prevail when the Barrage is in working order.

(*b*) Work on crops for the present and prospective needs of the country outside the Barrage areas.

Work under (*a*) is being exclusively carried out on the newly started Station at Sakrand, District Nawabshah.

Work under (*b*) is in charge of the Deputy Director of Agriculture, Sind, but the technique of all breeding work on crops is now being controlled by the Botanist.

The detailed information concerning its technique is therefore with the Botanist and will form a part of the latter's report. The outlines

of this work and its bearing on the agriculture of the Province is briefly given below :—

11. The crops dealt with are the following :—

1. Rice.
2. Jowar.
3. Wheat.
4. Cotton.

12. *Rice Improvement*—Work on rice is conducted on the Larkana Farm. An area of 21 acres 27 gunthas was sown with pure selected strains of rices for multiplication as under :—

	A. g.
Jajai-77	3—35
Prong-36	4—0
Kangni-27	13—32

The crop grew well, was free from disease and was above the average of the cultivator's crop.

The average outturn per acre of Jajai-77 came to 1,566 lbs., of Prong-36 to 1,320 lbs. and of Kangni-27 to 1,525 lbs.

Out of the quantities of the seed produced the following were distributed among the cultivators of the District for further multiplication :—

Kangni-27	16,815 lbs.
Jajai-77	1,190 ,,
Prong-36	3,464 ,,

The special feature of the multiplication work was the selfing of 200 plants as against 5 in the previous years so as to get 40 times as much selfed material as was formerly possible. This would mean a very great advance in the supply of superior seed to cultivators from 1929 onwards.

13. In the trial of new and foreign rices Kolumba strain 241 having given better outturn than Jajai in the year 1926, was further tested during the year under report with Jajai-77 and Kangni-27 but it failed to maintain its superiority both in yield and quality of grain and has therefore been dropped. Another variety known as Bengalo collected from Lower Sind in 1925 has been found to be a very good quality rice. It has been tested with Jajai-77 for the last two seasons and has yielded equally well but its quality seems to be better than Jajai-77. Hence this rice may be grown on field scale during the coming season.

14. *Maintenance of rice with special characters.*—Under this, five varieties are being retained from selfed material. To this two more additions were made during the year with characters of being extra early.

15. *Fresh selections.*—110 single earheads were collected in Kangni, Jajai and Prong from private fields for study and selection of the best among them.

16. *Jowar Improvement.*—The area under jowars on the Larkana Farm was 5 acres 18 gunthas and was sown for multiplication of seed with the following varieties selected out of a large collection for their high yielding capacity. :—

(*a*) Kedri.
(*b*) Baghdar.
(*c*) Saoro Kartuho.
(*d*) Alakh.
(*e*) Red Janpur.

The crop received a severe check by the locust attack when still young and later on was affected by long smut. Hence the outturn was very small but sufficient seed of each has been preserved for the present year's cultivation.

17. *Wheat Improvement.*—4 acres 19 gunthas were sown for the multiplication on the Larkana Farm with the improved strain of Thoree wheat (A.T.-38) and Pusa 12 as under :—

	A. g.
A.T.-38	1—19
Pusa-12	3—0

The average outturn of the former was 523 lbs. and of the latter 794 lbs. per acre.

The crop grew thin due to big "kalar" patches in the plots.

In addition to the above area 1 acre 20 gunthas were devoted to the maintaining of the selected strain of Pusa-12 and A.T.-38. The produce of this area will be grown on the Jacobabad Wheat Farm for multiplication; while Cph.-47, the produce of the breeding patch, will be grown at Larkana under irrigation.

18. Wheat is the main crop on the Jacobabad Farm and is sown for multiplying seeds of the Sind selected strains as well as of Pusa-12. The area sown here during the year was 80 acres as follows :—

Variety	Area	Total outturn
Pusa-12	50	42,788 lbs.
A.T.-38	30	25,260 ,,

The average outturn per acre of the former was 855 lbs. and of the latter 842 lbs. This average is considerably above the average of the cultivators' yields. The whole of this area was "Bosi," *i.e.*, the crop did not receive a single irrigation during its growing period.

In addition to the above, 2 acres were devoted to the selfing and breeding patches of the two strains of wheat, *viz.* Pusa-12 and A.T.-38 under the control of the Botanical staff.

Certain observations made by the Superintendent Wheat Farm, Jacobabad, on the crop show that—

(*a*) Flooding should not be less than 14" in each plot and it should be given in one watering preferably. If two waterings are unavoidable

the first should be followed by the second in quick succession before the land entirely soaks up the first irrigation.

(*b*) Dry ploughing with the Rajha plough conduces to better results in bosi cultivation than working it during preparatory tillage after irrigation.

(*c*) Clayey kalar plots were brought under better tilth by first discing and then ploughing and clod crushing.

(*d*) In order to get good stand of wheat in kalar plots, flooding should be commenced right from the beginning of "abkalani" season to drive down salts.

19. On the Seed Farm Mirpurkhas 29 acres and 32 gunthas were sown with Pusa-12 wheat. Out of this 10½ acres did not receive any irrigation after sowing and gave an average yield of 4 maunds 12½ seers per acre only. The rest of the area received 3 irrigations and averaged 10 maunds and 28 seers per acre.

20 *Cotton Improvement*:—On the Seed Farm, Mirpurkhas, the total area sown with cotton was as under:—

		A. g.
Maintenance work on F.-4 cotton W.N.	..	3—7
and 27 Multiplication Area .. F.-4	..	30—4
27 W.N.	..	31—0

The germination and after-growth were both very good and good outturns were expected but the heavy rainfall of 30 inches falling in a spell of three days in July destroyed the crop to such an extent that only 11 acres and 23 gunthas of F.-4 survived. This crop too was by no means healthy as just before ripening it was attacked by red leaf blight. The total outturn from this area amounted to 6,758½ lbs. or an average of 584 lbs. to acre as against 640 lbs of the last year.

The ginning percentage of F.-4 American cotton was 31·86.

21. *Chellaro Plot.*—The Chellaro Plot (Taluka Mirpurkhas), started five years ago for multiplication of cotton seed, had the following area under cotton in the year under review:—

	A. g.
F.-4	208—1
27 W.N.	175—14

Due to late arrival of water in the Jamrao Canal, the cotton sowings were continued right up to the middle of July. The torrential rains of July-August had however a bad effect on the crop. It remained submerged under water for nearly a week. As the whole country round about being one sheet of flood water, the Farm water could not be drained off. The total area thus damaged was from 100 to 120 acres. Whatever crop remained was also sickly and resulted in the F.-4 cotton giving the average outturn of maunds 3 and 9 seers and the 27 W.N. maunds 3 and 3 seers per acre. The Plot showed a profit of Rs. 6,360-5-9 after deducting Contingencies but an additional expenditure of Rs. 5,042-5-10 was this year required to be incurred in the shape of water charge as per

decision of Government which was not hitherto levied. Hence the net profit was reduced to Rs. 1,317-15-11 only.

22. *Miscellaneous crops.*—Berseem or Egyptian Clover.—The problem of fodder growing stands in importance of the first magnitude, as without good fodder good cattle cannot be produced and without efficient cattle good crops cannot be raised.

The period of fodder shortage counts about six months in the year, say from December to beginning of June and the absence of good fodder tells heavily upon the development of cattle whether draft or milch. Where irrigation facilities are available, Berseem (Trifolium Alexandrium), a leguminous plant, is the best fodder for the purpose. It is not only very nutritious but being leguminous helps to restore the fertility of the soil. Of the Government Farms in Sind, 3 Farms offer such facilities and these are the Willingdon Cattle Farm at Malir, Buffalo Farm at Sukkur and the Rice Farm at Larkana. 25 acres were grown at Sukkur, 5 at Larkana and 5 acres at Malir. The crop grew excellently well. In all 3 cuttings of green fodder were taken and both at Larkana and Sukkur some plots were left for seed purpose but the abnormal frost by the end of January and the first week of February affected the crop so much that there was practically very little seed formation.

The average yield of fodder per acre this year comes to about 29,438 lbs. and the maximum 50,512 lbs. as against 31,735 lbs. and 51,650 lbs. respectively of the previous year.

This year's low yield is attributed to the severe spells of frost mentioned above.

Berseem is now very largely grown at Hyderabad and every year the area is on the increase. It shows that it has caught on the people, but the insufficiency of seed supply stands in the way and has yet to be solved. In the year under report 1,200 lbs. of Berseem seed were imported from Egypt and distributed in Hyderabad alone and in the current year the indent received amounts to over 2,500 lbs. from this place alone. Arrangements are being made to import this quantity from Egypt.

23 *Gram.*—It is customary to rotate as far as possible gram with wheat to maintain the fertility of the soil, moreover it supplies nourishing and palatable green feed for the cattle. It is always the second growth which is allowed to mature for seed. Sown by October-November it is fit for grazing or feeding by the 1st of January, after this the grazing is stopped and the crop is allowed to grow for seed.

An experiment was laid out on the Wheat Farm, Jacobabad, on an acre plot to find out the relative yielding capacities of following grams :—

Pusa-9	..	small white.
Local white	..	,,
Pusa-12	..	big seeded white
Amritsar	..	,,
Local black	..	

These were sown in replication.

The yields per acre are worked out as below :—

Variety	Yield in lbs.	Remarks
Pusa No. 9	460	This is greatly appreciated for local use.
Local white	420	This is in demand by exporters. It is more susceptible to frost than No. 9.
Amritsar big	20	Colour is good but it was affected by the caterpillar in its young stage.
Pusa-12	45	It is more susceptible to frost than the last but grows well and was immune from disease.
Local black	450	This is hardy but fetches Re.1 per maund less than Pusa-9.

24. On the Seed Farm, Mirpurkhas, a white variety of gram was sown on an area of 13 acres 13 gunthas. The crop was attacked by caterpillars which did some damage. The average outturn amounted to 310 lbs. per acre.

25. *Matar.*—24 acres 17 gunthas were put under this crop on the Larkana Farm during the year under report as a 'dubari' crop after rice. The crop on the country side was almost destroyed by the frost but the Farm crop escaped the damage because the usual grazing by the cattle had by chance finished up before the frost came. The crop apart from affording a good grazing for the cattle gave 4,329 lbs. of grain.

26. *Crop Pests and Diseases.*—Rice crop in Sind has in recent years begun to be affected by diseases called "Kani Rati" in Upper Sind and "Ruro" in Lower Sind. In Lower Sind the "Ruro" disease broke out soon after the heavy rains of July-August and affected the crop to such an extent that even the cattle refused to eat the rice straw or the stubble after harvest. The crop entirely failed in some parts necessitating large remission of land assessment by Government. The disease has been identified by Dr. Uppal to be the smut caused by Tilletia horrida and by a species of Helminthosporium oryza. It is believed that the disease is seed-borne and hence an experiment in the treatment of the diseased seed with fungicide has been started from the current year.

Complaints of grasshopper on rice were also serious in Sukkur and Larkana District. Necessary instructions on the control of the pest were given by the Department.

Rat Pest.—A large scale demonstration in the method of rat destruction was again conducted at two centres in each of the two Divisions, *viz.*, Shah Bunder Division of Karachi District and Tando Division of Hyderabad District as sanctioned in Government Resolution No. 9431 dated the 28th April 1927. The zamindars on whose lands the operations were conducted have been completely satisfied and have spoken highly of the effectiveness of the method and the cheapness of the operations. The work has now passed the experimental stage but Government have

sanctioned the proposal in Government Resolution No. 9431 dated the 16th May 1928 to continue the demonstration of this method on small scale to keep up the interest of the people and also to give still wider publicity to the method. This demonstration is being arranged in the current year.

27. *Locusts.*—This pest was not very destructive to crops in the year under review but a provision of Rs. 10,000 had been made by Government in the Revenue Department for the destruction of eggs and the hoppers and a part was utilized for the purpose by the Collector of Thar Parkar. Similar provision exists for the current season.

28. *Fruit.*—The Fruit Farm, Mirpurkhas, remained in charge of Mr. Mahomed Umarkhan Barakzai till April 1928, when his services were requisitioned for other important work at Sakrand. From April onwards the charge has been held by Mr. S. R. Gandhi with a designation as Horticulturist. This Farm suffered very much from the destructive floods of July-August 1928 which washed away most of the young seedlings and plants and filled the newly constructed well with the silt to an as much depth as 16 feet. Hence much of the newly started work was destroyed and further extension of work in consequence fell short of the programme. The Farm has however now revived of the shock and the extension area is being filled up as quickly as possible.

The die-back disease from which the Nagpur and Saharanpur Santra trees were found to be suffering has been checked by deep ploughing and green manuring started by Mr. Barakzai. The trees have put on healthy growth.

From among the collection of American oranges the Royal George and the American Navel orange, fruited, the fruit presenting the characteristic navel mark. Malta, Dancy, Lodhi, Kowla and Marsh Pomelo have also fruited heavily and will produce material for judging their commercial value in 1928-29.

Demand for young fruit plants continues to be as keen as ever but the supply being limited as a result of the destructive floods only 244 plants were sold at a cost of Rs. 172-4-6. Out of this number 164 plants worth Rs. 89-8-0 were given gratis.

The total sale proceeds of fruit, etc., amounted to Rs. 1,601-9-5.

29. *Live Stock Improvement.*—The work in the direction of cattle improvement in Sind consists in the—

(1) Maintenance of a herd of cattle of Red Karachi breed at the Willingdon Cattle Farm near Malir (Karachi),

(2) Maintenance of a herd of Buffaloes at Government Farm Sukkur.

30. *Willingdon Cattle Farm, Malir.*—The administrative control of this Farm has been transferred to the Deputy Director of Agriculture, Sind, on 1st April 1927—the Live Stock Expert to Government controlling the technical policy. The red Karachi breed is recognised to be the best milk producing cow in Asia but has certain other defects, *e.g.*,

long ill-shaped pendulous udder which easily gets injured. It is in order to eliminate this and to get—

(*a*) Early Maturity,
(*b*) Regularity of breeding, and
(*c*) Improvement of milking quality,

that this Farm has been started. This is the sixth year of its working and during this short period it has built up a fine herd with strains having one or more of the following qualities :—

(*a*) Milking capacity,
(*b*) Size,
(*c*) Good udder development.

It will be by breeding and selecting these strains that good udders will be fixed in animals of high milk yield. In fact the year under review has shown that the heifers which calved during the year have a distinct improvement in the shape of their udders over that of their dams. During the year under review the Farm had :—

1 cow giving over 8,000 lbs. of milk per lactation,
2 cows giving over 7,000 lbs. of milk per lactation.
1 cow giving over 6,000 lbs. of milk per lactation,
4 cows giving over 5,000 lbs. of milk per lactation,
7 cows giving over 4,000 lbs. of milk per lactation.

The above milk records are exclusive of the quantities sucked by calves.

The year was marked by the breaking out of a virulent type of foot and mouth disease in the country side and affected the Farm animals too, as well. With all precautions and treatment 60 animals contracted the epidemic with a death roll of 15.

Eight bulls were used on the Farm for service and performed 47 services.

The number of bulls issued under Premium bull rules was 1.

The total quantity of milk produced was 121,667¾ lbs. and the total sale proceeds amounted to Rs. 6,877-6-5.

The number of animals sold during the year was 6 and the number purchased was 3 entirely of Thar Parkar breed.

The number of births was 36 and deaths 17.

The total strength of herd on April 1st, 1928 was as under :—

Breeding bulls	6
Young bulls	10
Cows	41
Heifers	20
Work Cattle	13
Castrated stock	4
Bull calves	20
Cow calves	17
Total ..	131

In the matter of cultivation of fodder and the provision of hay, the area cropped with fodders in Kharif was 13½ acres and in Rabi 6 acres. In addition to this 7 acres were under permanent fodder, *viz.*; Elephant grass and lucerne. The quantity of hay made during the year amounted to one lac lbs. Owing to good rains the grazing area afforded good pasture for the cattle.

The boundary wire fence which was erected of old material has now given way in several places. To repair it is out of question as the cost becomes prohibitive. A programme has been laid down to gradually establish a live hedge on all the four sides of the Farm and this when completed will not only be of a permanent nature but will eliminate all costly expenditure on annual repairs which the iron fence requires.

31. *Buffalo herd at Sukkur.*—The buffalo herd was started in 1918-19 with a view to investigating the possibilities of mixed farming and also to improving the local breed by selection of the best milkers. By this time the animals of the second generation are in performing condition.

The strength of the herd on the 1st April 1928 was as follows :—

Adult buffaloes	8
Heifers in calf	2
Buffalo calves Male	2
Female	11
Buffalo bulls	1

During the year there were 8 births and 1 death.

The total number of animals that remained in milk was 10. The best animal gave 5,144 lbs. per lactation as against 5,563 lbs. last year, and the average per head was 4,000 lbs.

Rinderpest disease broke out in the young and dry buffaloes kept on the Larkana Farm and resulted in 2 casualties and of abortion in 2 heifers.

As a result of previous experiments it has now been possible to fix the rate of concentrates as the best and most economical for the milch cattle on this Farm. The following is the scale employed :—

Milk yield in lbs. per day	Concentrates in lbs. per day
Lbs.	Lbs.
20 or over	9
15	7
10	5
Under 10	3

But in case of green feed, two-thirds of the above ration was used.

The green feed used was jowari, guar and Berseem. The total production of the milk was 41,259 lbs. 12 oz.

From the figures recorded on the Farm, it is satisfactory to note that some of the heifers have done better performance in comparison to their dams.

Investigations made on the Farm show that the cost of production per 100 lbs. milk comes to Rs. 8-3-0 whereas the average selling price was Rs. 11-15-6. Hence the net profit on 100 lbs. of milk was Rs. 3-12-6. The cost included cost on production of fodder, cost of concentrates and the labour employed on the Dairy.

Demonstration and Propaganda

32. Before giving a short account of the year's work under this head it will be interesting to give in a few lines a retrospect of the work done upto date and its effect on the agriculture of the country.

A quarter of a century has now passed since the foundation stone of the Agricultural Department's work was first laid at Dhoro Naro—an out of the way place in the Thar Parkar District in the year 1904. Has this period wrought any change for the better in the agricultural methods of the country, have the agricultural class taken kindly to the innovations or have stuck to the time-honoured customs of his fore-fathers—are the questions to which this retrospect is an answer. To what extent has the Agricultural Department been instrumental in bringing about this state of progress, will at the same time be revealed through the lines of this review.

The hari of the present day is not the same as of old about whose progress everybody was so pessimistic. Times have shown that he can change, lazy though he may be. He is quick to copy what he finds advantageous in his neighbour's fields. But he at the same time requires a kind and sympathetic master in his zamindar. It is mostly due to the latter's influence that improvements are possible. It is indeed fortunate that several of the zamindars have now begun to take real interest in their cultivation work with the result that a silent and imperceptible revolution is taking place in the agricultural methods of the country. It will be worthwhile to quote an instance of a zamindar whose haries have become very prosperous. Mr. Perozshah of Nawabshah says: "By my co-operation with the haries for the last 23 years they now possess live-stock worth about Rs. 25,000, most of this live-stock numbering about 1,500 are herds of goats and sheep belonging to haries who live with their families outside the village. They make these herds sit at night to manure the lands allotted to them for cultivation. Besides goats and sheep they have got other useful animals from which they maintain themselves.

"In short if haries work continuously for 12 months and zamindars co-operate with them and lend them money, I am sure the condition of Sindhi haries will be bettered and they will prosper as my haries do.

"A survey number was sown with N.R. cotton seed given by the Agricultural Department, after giving four ploughs crosswise in winter 1927-28 it gave 41 maunds of phutties in the first picking, the plant reaching five to six feet high. These are the advantages of thorough ploughings in winter and of good seed. My firm belief is that if haries plough their fields and work heartily as my haries do, they will be as happy and prosperous as they. There is a saying in Sindhi that 'Jetra hur autra

fur' meaning the more you plough the more you gain. Knowing this very well it is a pity that they do not work heartily."

Good cultivation means good ploughs and good crop means good seed. Barely one now finds the old Sindhi type of plough in intensive areas. All over the tract the improved type of ploughs such as the Sircar, the Meston, the Monsoon or the Chattanooga hold the sway. People appreciate the value of our pure strains of the known value such as 27 W.N.,F-4 cotton, Pusa-12 and A.T.-38 wheat seeds, improved types of paddy and jowars and they do not hesitate to paying even more per maund than the prevailing market rates because the trade also pays some premium on the produce of these pure strains. Who could have said that the lazy Hari of Sind would take to dry ploughing of his land. But one finds numbers of them now busy ploughing away their lands, in the months of January-February which they intend to sow with cotton, paddy and wheat subsequently.

Hand weeding in cotton is now being steadily replaced by interculturing by bullock power where facilities exist whether the crop is sown broadcast or drilled. This means economy in expenditure on crop production and consequent high returns.

The old methods of raising water whether from canals or wells are gradually dying out. The old Persian wheel is being replaced by a handy iron lift giving at least two times the discharge yet requiring the same power and the Jamrao tract has become thickly dotted with workshops for the manufacture of these lifts and ploughs and other improved implements. Pumping of water by power is also becoming a common sight. Where underground water could be tapped people have not been slow to put up bores and instal pumps on these. Such successful bores are now in use in several parts of Sukkur and Jacobabad District. Nobody believed of such a change in the agricultural condition of Sind 20 years ago but these are the facts which stand out conspicuously to prophesy still further progress for Sind.

In the Rice tract of Larkana District people have been very quick in copying methods adopted on the Larkana Farm. Dry ploughings of the paddy fields which was unknown about 8 years ago is now replacing the old wasteful "Daph" method (puddling) and it is now customary for a zamindar to take an agreement from his hari to dry plough the rice land and his inability to satisfy him debars him from the benefit of cultivating any portion of the zamindar's land. The effects of early transplantation noticed on the Farm have impressed cultivators so much that several katcha wells have now sprung up on the holdings of zamindars to raise seedlings to keep them ready for transplanting immediately on the arrival of the inundation water. Reduced Seed rate in paddy cultivation and the use of Sulphate of Ammonia in place of the cow-dung as Râb material in raising rice seedlings and on which two separate leaflets have been issued by the Department are being practised by the zamindars.

33. *District Work.*—The District Work is conducted through the agencies of the Taluka Development Associations where they exist and

elsewhere direct by the Department through the instrumentality of its District Agricultural Overseers. A reference to the last year's report will show that 20 Talukas have been selected for intensive propaganda and more are awaiting exploration for want of sufficient staff and funds. The lines on which the district work is conducted are the following :—

(1) Introduction of pure and superior kinds of seeds.

(2) Introduction of superior tillage implements.

(3) To make facilities to provide both (1) and (2).

(4) Organization of district demonstration parties and holding of shows.

(5) Publication of agricultural results found suitable in leaflet forms.

(6) Assistance by Mechanical branch.

(7) Tractor demonstration.

34. The total quantity of 27 W.N. seed distributed in the intensive talukas during the current year was 501,492 lbs.

The above includes the seed multiplied by the certified growers.

35. *American Cotton.*—The variety in demand is F-4 although in the current year a demand for 285F has also arisen. The progress that the cultivation of F-4 cotton is making in spite of the adverse irrigation condition is wonderful. The total area cropped in the Southern Jamrao District in the year under report was returned at 23,908 acres. The figures of the Northern Jamrao and the Mithrao Canals are not available. Assuming that the area in the latter two tracts was not very appreciable yet the figure of 23,908 acres is satisfactory when we remember that the water in canals came so late as June which is ordinarily a late date for American cotton cultivation.

The quantity of pure seed of F-4 directly distributed by the Department was 37,290 lbs only. Reduction in the quantity of seed distributed is entirely due to the destructive floods which considerably damaged the crop of Seed Station at Chellaro.

36. *Wheat.*—The kinds and quantities of wheat seeds issued of each variety were as under :—

Variety	Jacobabad Farm	Larkana Farm	Total
	lbs.	lbs.	lbs.
Pusa-12	53,712	1,733	55,445
A. T.-38	5,739	459	6,198
C. P. H.-47	6,149	2,419	6,568

In addition to this, 409,680 lbs. of 8A wheat were imported from the Punjab for the flood affected areas as under :—

Thar Parkar District .. 352,000
Tando Division .. *57,680* = 409,680 lbs.

37. Rice seeds of the strains of Kangni, Jajai and Prong are now regularly issued for cultivation chiefly through the Seed Society in the Larkana District on the understanding that the Department could buy back the seed for further distribution. The quantity distributed in the current year amounted to 21459 lbs.

38. *Jowar.*—During the current year 346 lbs. of jowar seed of the four different types of jowars were distributed for multiplication.

39. *Implements and Machinery.*—The implements in demand are mostly the Sircar, the Meston and the Chattanooga ploughs, the Cambridge Roller, the Hand Archimedian screw and the steel ploughshares. These are being issued directly by the Department and by the Firms manufacturing these.

In view of the fact that the Department has in recent years been flooded with the various types of ploughs some copied and some original and about which one kind of advantage or the other was claimed by the manufacturers it was decided to have a test of several types of these carried out with special reference to weight, draught, quantity and quality of work of each type and also the cost with a view to selecting the best types out of the several. A statement of this test has been made out and we are now in a position to recommend definitely certain types suitable for certain tracts.

40. In the matter of improved methods of cultivation we had our usual demonstrations of sowing cotton in lines as against broadcasting the seed. In a year of late inundation which has now become the feature of irrigation, rapidity in sowing irrespective of any consideration for the quality of work, becomes the rule. Hence the area operated upon was far too below the original programme. The method is however appreciated by the public in as much as fields can be seen cultivated with this improved method independently, in areas where irrigation conditions admitted this to be done.

41. The small Sub-station at Jamesabad started some years ago with the object of educating zamindars in the new and improved methods of cultivation was again successfully run. It gave a net profit of Rs. 268-9-10 which is significant looking to the agricultural season which was one of the worst on record.

42. The village to village demonstrations with improved implements and seeds is the usual routine now and was carried out by both the departmental staff and through the agency of Taluka Development Associations in 155 villages.

43. Several enquiries were received from the Co-operative and Revenue departments for advice in connection with the grant of loans to zamindars under the Land Improvement Loans Act and were duly attended to.

44. In addition to the above one big show at Jacobabad (Upper Sind Frontier) and a small one at Nawabshah were organised and successfully run.

45. Among other services rendered to the public were the help given by our Mechanical staff in connection with the pumping and boring operations.

46. Tractor demonstrations were held in March last at 4 villages of the Jacobabad taluka and again for a month at 11 different centres in the Sukkur and Larkana districts.

47. *Taluka Development Associations.*—There are three Taluka Development Associations under the direct control of the Deputy Director of Agriculture and are doing good work. Owing to shortage of funds starting of new associations has been temporarily suspended. All the associations held one general meeting each and 10 managing committee meetings except that of Mirpurkhas which held only 7 meetings. Most of the seed distribution in these three talukas was done by these associations. The total membership of these associations is 321 and the financial position is quite strong, there being a total balance of Rs. 3,850 at their credit in the bank.

48. Activities of the miscellaneous nature are described below :— Fodder shortage. As a result of the heavy rains, the rice crop in Tando division was not only a partial failure but had been greatly damaged by a disease called ' ruro ' so much so that the cattle refused to eat the ' palal ' or the rice straw. As rice crop is the only source of fodder in this tract, a fodder famine was apprehended. In order to gauge the intensity of fodder shortage and at the same time to take steps to meet the deficiency if any, the Collector of Hyderabad convened a meeting of some officers of the Agricultural and Revenue departments, some prominent zamindars of the locality and representatives of the Co-operative societies. This conference met at Hyderabad on the 10th of February 1928 and it was decided that the officers of the Agricultural Department should purchase the necessary fodder from funds to be given by the Collector and then despatch wagon loads to Tando Mahomedkhan. In accordance with this decision, Messrs Lokeram and Umershah who were deputed for the work, purchased about 2,218 maunds of chaffed kadbi at a cost of Rs. 1-4-6 per maund including bags delivered at Tando Mahomedkhan. These officers were however subsequently relieved of this work by the volunteers of the Relief Fund on 31st of May 1928, after the latter having been initiated into the business by our officers. This made the work very smooth for the volunteers.

The Collector of Hyderabad in his letter No. F.E.5345-I.F. dated 8/9th May 1928 appreciated the services of the above two officers and thanked them for the same.

49. The heavy rains of July 1927 had submerged a good portion of land in Mirpurkhas, Jamesabad and Digri talukas. In order to take advantage of this flood, zamindars were advised to grow torio oil seed as bosi crop. At the request of the Collector of Thar Parkar negotiations were started with the Punjab Agricultural Department for the supply of good seed of torio but as the final decision took some time and the season had also advanced it was thought advisable to buy this

seed from local stocks; accordingly the Collector arranged to get this seed from the Agent of Messrs. Ralli Brothers.

At the same time the Collector requested the department to import a good kind of wheat seed. Accordingly 4,000 maunds of 8-A wheat were imported through the Punjab Agricultural department and supplied to the Mukhtyarkars of Jamesabad and Digri who distributed the seed to the cultivators as taccavi loans.

There was also a demand for good wheat seed from Tando Bago and Badin talukas but as the Collector of Hyderabad could not spare any money from his taccavi advance, only 721 Maunds of 8-A wheat seed were imported from the Punjab from the P. L. A. funds and distributed against indents already registered. This seed has greatly satisfied the people. It is a heavy yielder and also it is rust resistent. It is expected that the area under wheat in this tract will greatly increase if some means were found for storing the seed. Owing to damp climate, the seed is weevilized and consequently the growers do not venture to store it but depend on fresh importations.

50. *Boring operations.*—There is one hand-exploratory machine in Sind. During the year under review 3 successful bores were made in the wells of Mr. Boman Irani at Malir. They are giving sufficient water to keep the engine going the whole day. Rs. 300 were recovered from the owner and remitted into the treasury.

The machine is at present at Sakrand where six borings have to be taken with the idea of seeing how the sub-soil water level varies from season to season. Three such bores have been made during the year and after the remaining three are made, the machine will be returned to the Executive Engineer Boring at Nasik who will henceforth control all boring operations.

51. *Agricultural bias schools.*—The number of these schools is seven. No new school was started during the year though there was a proposal to open two new schools. All these with the exception of Chak and Malir are doing fairly good work.

52. *Cotton finance.*—At the suggestion of the Indian Central Cotton Committee, investigations into the cotton finance were conducted during the year, the cost being financed by that body which amounted to Rs. 6,800 about. A senior graduate with two assistants was placed on this special duty for about 8 months. The report has been submitted to the Central Cotton Committee and will soon be published. It gives very interesting data on the financial position of the cultivators.

53. *Linlithgow Commission.*—The Deputy Director of Agriculture, Sind, submitted a written paper for the Royal Commission on Agriculture and appeared before it at their Karachi sessions to give oral evidence.

GULMAHOMED A. R.

Deputy Director of Agriculture, Sind.

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APPENDIX I.

Summary of work done under the Professor of Agriculture, Poona, during 1927-28.

1. *Charge.*—Mr. V. G. Gokhale was in charge of the section throughout the year except from 26th November 1927 to 8th May during which period Mr. B. S. Patel held the charge as the permanent incumbent.

2. *Lines of work*—A. *Teaching.*—This is the primary work of this section and includes the teaching of the Agricultural subjects (including Animal Husbandry and Dairying) of the University Courses for the degree of B.Ag. at the Poona Agricultural college, which represents *about 50* % of the total teaching work of the college. For the teaching of the practical work two large institutions—the college farm and the college Dairy—have to be run.

In addition to the teaching of the University Courses, this section has also to do the teaching of Agriculture (including Animal Husbandry and Dairying) to the "Short Course" class which forms nearly 73% of their total instructional work given to this class.

Special Courses in farm management, Poultry and Animal husbandry are also given to a limited extent as resources can permit.

B. *Research and Investigation.*—Whatever is possible to be done and suitable for the amount and character of time left, after satisfying the primary needs of teaching and administration of the two institutions connected with teaching, is being attempted.

C. *Commercial working of the Dairy.*—The college Dairy besides affording facilities for teaching is run on commercial lines.

D. *Aid and Assistance to the Public.*—A number of demands for information, seeds, implements, etc., on Agriculture and Animal husbandry matters are received from the Agricultural public and educational institutions either by correspondence or in personal visits, which have to be satisfied.

3. *Staff.*—The strength of the staff was the same as last year, namely :—

1 Professor of Agriculture.

2 Assistant Professors in the Bombay Agricultural service.

3 Lecturers.

5 Demonstrators.

Mr. H. M. Desai, second Lecturer in Agriculture, was deputed to Gujrat on flood relief work for a month and a half, his work at this section being carried on by the loan of another departmental man that could be spared.

Mr. T. N. Chaugule, senior Demonstrator in Agriculture, was specially taken as Head master of the Marathi Agricultural School at Loni-Kalbhor in June 1927. Mr. M. B. Ghatge, a new Graduate of 1927, was taken in his place.

Mr. D. B. Kolhe, senior Demonstrator in Dairying, went on fifteen months' leave for higher training at the Imperial Dairy Institute, Bangalore, from December 1927. Mr. B. G. Oka, a fresh graduate of 1927, was taken up in this vacancy.

Mr. K. S. Kulkarny, first Lecturer in Agriculture and Superintendent, Agricultural college Farm, continued to be in Command of the college Platoon as a second Lieutenant in the 1st Bombay Batallion, U.T.C.I.T.F.

A. Teaching.

4. The somewhat anxious feature of the year was a large number of failures in the University Examination in the subject of Agriculture. On a very careful examination of the reasons for this, it appears that the subject of Agriculture is very indefinite, vague and vast and from the general trend of questions as well as results of the last two examinations it seems too much is expected. If this standard is to be satisfied more time ought to be assigned to this subject in the Time-Tables than at present. It is believed also that one examination at the end of the course for such an indefinite and vast subject covered in two years puts the students to disadvantage in memorising all that they learn in two years' time. Thirdly it appears that the introduction of optionals occupying one-third of a full year has deprived the students and the teachers of an unduly large proportion of time from their attention to the general subject of Agriculture. Another important factor which must certainly be responsible for the comparatively larger failures in Agricultural papers, is the want of any suitable books pertinent to Agricultural conditions and practices in India in general and the Bombay Presidency in particular. The volumes by Mollison—specially the one on crops—are out of date and print. The students thus are left to do their best on the notes which they may take during class lectures. As a rule it is to be noted that such notes are scrappy and not quite as useful as they ought to be, and it is seriously doubted if the students at all in general are able to take intelligent notes. The production of text books is an urgent desideratum and though it is intended to make strenuous attempt to get it done through the existing staff whatever may be possible in the next few years, still rapid and adequate progress cannot be expected within the present strength of the staff who are almost fully occupied in their teaching and administrative activities.

Another feature of the subject of Agriculture in the year is a further reduction in the number of students who took intensive study of crops as their optional subject. The main reason for this declining tendency seems to be that these subjects are too general and indefinite, and the students have found from the experience of their passed friends that it is not as easy to score as good a number of marks in these as in other optional subjects. Moreover they somehow feel that specialised subjects have a better scope for getting an employment than the intensive study of certain crops.

The quality of the students who are attracted to this college is not generally of as high a calibre as in other professional colleges and if this college is to attract men of high abilities it is quite essential to hold out an inducement of at least one guaranteed post in the higher grades of Government Services to the first class first graduate of a year and also to assign at least some of the scholarships on educational merit.

5. One student (Corporal Chapman) was taken up in a special course of Dairying and Poultry. It is hardly possible to do this within the existing staff.

6. *The College Farm.*—The main function of the farm is to afford all possible facilities for the teaching of practical Agriculture. It also maintains a fairly complete collection of indigenous and improved agricultural implements both for the students as well as the general public and a workshop for the teaching of carpentry and smithy by the Engineering section of the college and for a certain amount of repair of improved implements of the public when possible.

The area has remained at 275 acres of which about 125 acres are cultivable, the rest being under college and other buildings, roads, wells, grazing area and waste land. In all about 15 acres of the land on the more recently acquired areas were bunded and drainage system of the estate was extended and renewed during the year.

As regards the season the total rainfall of the year from 1st of May 1927 to 1st of May 1928 was 26·57 inches. The rainfall in the growing period of kharif crop, though sufficient as regards the total quantity, was not quite favourable due to the following irregularities ; it was continuous in small drizzles from middle of July to end of August, giving no chance for weeding, the scanty rains in September adversely affecting the groundnut crop. The rains for the Rabi season though somewhat harmful to the ripe crops of *bajri* and early groundnuts was favourable for the rabi crops. The exact effect of this character of season on the crops can be seen from the following statement :—

Crop	Average yield per acre, 1927-28	Average yield per acre, 1926-27	Best yield in the history of the farm	
			Per acre	Year
Kharif Season	lbs.	lbs.	lbs.	
Early groundnut. (Spanish peanut)	1,305	1,600	2,082	1912-13
Late groundnut. (Pondicherry and big Japan).	1,924	....	2,768	1913-14
Bajri	1,181	360	1,632	1912-13
Cotton N. R. ..	752	772	1,960	1919-20
Rabi Season				
Shalu Jowar ..	1,379	....	1,842	1912-13

Thrips on onion, leaf-curl on chillies, aphis on *mogari* (rat tail radish) and cabbage and wilt on ginger took a heavy toll of these crops. None of these could be controlled by any of the remedies so far known and recommended by the Entomologist and the Plant Pathologist.

The most outstanding features of the year's cultivation of the farm were: *Nilwa jowar* for fodder continued to be the most profitable dry crop near Poona with a per acre yield approaching 10,000 lbs. of dry fodder and 750 lbs. of grain; maize was another fodder crop with an average yield of 40,000 lbs. of green nutritious fodder per acre; none of the other important dry crops—cotton, groundnut, *bajri*—resulted into profits. Out of the more costly garden crops, *siran* proved to be the best with its yield of over 20 tons giving a net profit of Rs. 1,300 per acre; yams and *gawar* with about two and a half tons of each stood next with a net profit of Rs. 567. Betelvine with 220 *kudtans* (I *kudtan*= 16,400 leaves), lucerne with 20 tons green fodder, *gawar* and *dodka* mixture and cabbage yielded a net profit of Rs. 200 or over; garlic with its net profit of over Rs. 100 is the only crop out of the rest which gave any appreciable profit.

7. *The Dairy.*—The only thing to be mentioned about this from an educational point of view is that the present unit is out of date and needs to be modernised in many respects. It is also lacking in representations of all the principal kinds and breeds of farm animals.

B. Research and Investigations.

8. The following is a resumé of the work done and progress achieved during the year.

9. *Investigations into the economic functions of the tillage implements and their improvement.*—This work which is being financed by the Sir Sassoon David Trust Fund was further carried on in its fourth year under the immediate direction and control of the Professor of Agriculture. The inferences drawn from this year's results do not differ from those mentioned in the last year's report (1926-27), except that loosening to a depth of 5" to 6" has given about 20 per cent. of increased yield of crop over unloosened conditions as against no appreciable increase in the past years.

The Crop Research Committee of the Department in its session of May 1928 came to the conclusion that this Research is too theoretic to be of much practical value and it should therefore be closed down.

The results obtained in the four years are under preparation for publication.

10. *Relation between the vigour of Chillie Seedlings and yield—By Mr. H. M. Desai, second Lecturer in Agriculture.*—Methods of growing vigorous Seedlings were studied and it was found that raised seed-beds with a top dressing of sulphate of ammonia, sulphate of potash and bone superphosphate in addition to farm yard manure before sowing gave the most vigorous seedlings. Further comparisons about

the performance of the crops between ordinary vigour and extra vigour were vitiated by the appearance of mosaic disease.

11. *Further trials of improved methods of growing ginger under Poona conditions—By Mr. H. M. Desai, Second Lecturer in Agriculture.*—It was in the year 1925-26 that the experiment was begun with very good outturn for broad ridge method as against almost total failure in the past many years. The results of 1926-27 and 1927-28 were however too poor due to wilt to confirm the previous year's results as being only due to the broad ridge method.

12. *Investigation into a cheap and efficient silo for the Deccan.—In collaboration with Mr. H. G. Baluch, Assistant Professor of Animal Husbandry and Dairying.*—An underground round silo pit about seven feet in depth and raised two feet above ground lined on the earthen side and bottom merely by one and half inch thickness of cement concrete and a final coating of cement one-fourth of an inch thick has been found to be quite as efficient as any *pucca* masonry built tower silo, if only the top two feet sides below and above the ground level are reinforced by a two feet thickness of lime concrete. The diameter might be anything above 10 feet according to the number of animals to be fed.

A sixteen feet diameter silo of the new type costs about Rs. 225 as against Rs. 2,500 for a *pucca* tower silo and Rs. 30 for a *kacha* pit silo of the same dimensions. It was found that whereas a three inch layer at the top and at bottom and 2-3 inches on sides gets spoiled and rendered unfit for feeding in the *kacha* pit silo, only 2-3 inches respectively were so rendered unfit for feeding in the new silo. The value of the difference in the losses by the two methods for a size of the above dimensions amounts to about Rs. 50 for one filling. After getting further verifications and data full details of constructions and economic advantages would be published.

13. *Developing of early maturity and regular calving in Sindi cows and Surti buffaloes of the college Dairy—In collaboration with Mr. H. G. Baluch, Assistant Professor of Animal Husbandry and Dairying.*—The material available has been examined and it has been found that the same can afford considerable scope for work in this direction. This is a line of work that would take several years to get substantial results. Indications of requirements in point of feeding and management for this purpose have been also obtained.

14. *Economic possibilities of the Poultry Industry in the Deccan.—In collaboration with Mr. H. G. Baluch, Assistant Professor of Animal Husbandry and Dairying.*—The year under report brings us the experience of over two years with the two breeds :—(1) White leg-horn and (2) Australorp which have acquired some reputation of suitability to Indian conditions. Two generations have now been born in Poona and the strength of the flock averaged about 40 hens and pullets and about 100 chicks under rearing.

The performance of the foundation stock birds which are reported to give an average annual output of about 250 eggs and of their progeny here, is as follows :—

Name of breed	Original Birds		Poona Progeny		
	1st year of introduction, 1926-27	2nd year of introduction, 1927-28	1st generation		2nd generation, 1927-28
			1926-27	1927-28	
White Leg-horn ..	112	103	167	146	177
Australorp ..	112	93	150	149	165

This shows that whereas the imported birds do not fare as well as in their place of birth, the progeny obtained in Poona from them is distinctly superior, the second generation being still superior to the first.

This year the whole concern which realised Rs. 98 for 14 adult birds, Rs. 559 for 307 chicks, Rs. 100 for 15 dozen eggs for setting, and Rs. 225 for 305 dozen eggs for table, has given a net loss of Rs. 17 ; seventy-one chicks were killed being deformed and weaklings and 57 died of disease.

Although the business of the year does not show a profit to a capitalist who will get all the work done by hired labour it has been able to give a return of about Rs. 160 for the labour equivalent to one whole-time unit of a family doing this work as a subsidiary occupation.

The economic possibilities of this industry cannot yet be said to be bright in general as the demand at the high prices realised in the above mentioned concern for a large number of eggs, chicks and birds, for breeding purposes cannot be so large as to benefit all.

C. Commercial Working of the College Dairy.

15. Besides affording facilities for practical teaching this is intended to demonstrate the possibilities of modern dairying as a business and to serve as a centre for breeding pedigree animals of *Sindi* cows and *Surti* buffaloes.

The strength and composition of the herd has practically remained the same as in the previous year, totalling 225 head. During the year a lot of 12 she-buffaloes selected in their home breeding places round about Anand in Gujarat, for affording individuals of higher milk yields than the highest in the college Dairy, has been brought. As it has been found very difficult to sell cow's milk at the same prices as that from buffaloes, the number of cows is being brought down.

The following table compares the performance of the animals during the year with that of the previous year :—

Year	Average number of milking animals in the herd	Number of animals in each herd		Average annual yield per head		
		Cows	Buffaloes	Cows	Buffaloes	The whole herd
				Lbs.	Lbs.	
1926-27 ..	75·74	34·16	41·58	3075·90	3366·90	3235·6
1927-28 ..	76·91	30·70	46·21	3062·32	3175·83	3130·5

The average annual milk yield of buffaloes shows a decrease of about 200 lbs. during the year under report; the reason of this seems to be the larger number of dry days in this year than in the previous one, as could be seen from the column of the average number of animals in milk in the next table.

The subjoined table compares the financial aspect of the year under report with that of the previous year :—

Year	Average number of milch animals in the herd	Average number of animals milked	Total milk production	Annual average milk yield per head in the herd	Total milk fed to calves	Total milk sold	Cost of production of 100 lbs. of milk	Money realised per 100 lbs. of milk
			Lbs.	Lbs.	Lbs.	Lbs.	Rs.	Rs.
1926-27	75·74	61·78	245,068·5	3,235·6	36,260·5	208,808	*(20·05)	18·26
							†17·8	
1927-28	76·91	59·51	240,768·75	3,130·5	29,224·5	211,544·25	(19·26)	16·35
							16·93	

(1) *Note.*—* Figures in brackets show the cost of one hundred pounds of milk available for sale after feeding calves.

† This figure shows the cost of milk production on the total output of milk yield.

The results above give a further reduction by about one rupee in the cost of producing 100 lbs. of milk as compared with the previous year in spite of a less average of milk per animal. But the value fetched by the 100 lbs. of milk either sold as such or converted into other products, has been less by about Rs. 2 than that of the last year. This is due to a large quantity of milk converted into milk products which fetch only about half of the milk sold as such. There is a loss of Rs. 3 per 100 lbs. of milk in this year's working. Had all milk been sold as such, the cost and value would have been balanced.

The noteworthy feature of fodder growing of the year was the increase in yields by about 25 per cent. more or less of almost all the important fodder crops :—*Nilwa jowar*, Maize, and lucerne. This has been due to the increased quantity of poudrette given during the year to these crops.

D. Aid and Assistance to the Public.

16. *Supply of Implements.*—Owing to the spread of private enterprise in the sale of Agricultural Implements, the College farm has, as mentioned last year, discontinued this on its old large scale. Yet 19 demands for implements like Stone-rollers for threshing *jowar* and local indigenous implements which are not kept on sale by firms were arranged to be supplied to public or semi-public institutions of this and other provinces of India. One-hundred and ninety-four enquiries about different kinds of implements were also directed to the proper sources.

17. *Supply of seed.*—The seed supply mainly consisted of early groundnuts, N.R. cotton, *nilwa jowar*, *Akola bajri* and vegetable seeds involving in all 190 indents. Two hundred and fourteen correspondents enquiring about seeds which were not available on this farm were advised as to the reliable sources.

In all 300 enquiries on various agricultural matters were dealt with by correspondence, and 120 parties of visitors were attended to.

18. *Publications.*—One leaflet on the practical system of storing farm yard manure (No. 5 of 1927) was written and has since been published.

Personal.

19. Every member of the staff put in the best of his endeavour and ability in carrying on his duties, and the name of Mr. H. M. Desai is to be specially mentioned as having attempted investigation work even through his crowded time for teaching and administration of a certain section of the farm.

V. G. GOKHALE,
Professor of Agriculture.

APPENDIX J.

Summary of the work done under the Agricultural Chemist to Government of Bombay, Poona, from 1st July 1927 to 30th June 1928.

During the year under report I was in charge of the office and Laboratory of the Agricultural Chemist to the Government of Bombay from 1st July 1927 to 25th February 1928, and again from 13th June to 30th June 1928. During my absence on leave Mr. N. V. Kanitkar, M.Ag., B.Sc., acted as Agricultural Chemist.

2. The work of the Agricultural Chemist may conveniently be divided into four sections as given below :—

(1) Analytical work done for the public and for the various sections of the Agricultural Department and other Government Departments.
(2) Investigation work.
(3) Teaching at the Poona Agricultural College.
(4) Water-finder work.

Analytical work.

3. The work under each section is increasing every year. The analytical Laboratory has gained great public faith and reputation and the people are making the fullest possible use of the laboratory.

4. The number of samples received for analysis continues to be as high as ever. In the year under report 1,251 samples were received. This number does not include samples analysed in connection with the investigation work carried on in the Chemical Laboratory. The classification of the samples shows that there were 453 soils, 318 manures, 64 waters, 92 feeding stuffs, 40 milk and its products, 181 oil seeds and oils, 56 whole plants of rice, bajri, jowar, etc., and 47 miscellaneous.

5. The samples from Government Departments numbered 821. Many of these were analysed in connection with the various problems under investigation in the different sections of the Agricultural Department. Soil samples were analysed for the Professor of Agriculture in connection with his investigation of the "Economics of Tillage and Implements," for the Soil Physicist in connection with his Dry Farming Experiments, for the Rice Specialist at Karjat in his study of rice, manures and so on. A large number of soil samples were received this year from Gujarat. Several areas in Gujarat suffered from floods in 1927 and samples of soils were sent from the fields of the cultivators from the various villages to ascertain to what extent the soils were affected in their fertility by washing of the soil or deposition of silt on them. The manures consisted of the usual materials for use on the farms as also artificial farm yard manures which are under experiment. A large number of leaves for manures were received from the Kumtha Farm. Some samples of whole plants of rice, bajri and jowar were analysed for the Rice Specialist at Karjat and the Soil Physicist as they are studying the total quantities of the manurial constituents which the different crops remove every year

from the soils. The Economic Botanist in his study of castor and other oilseeds requires the determinations of oils from them. This year in order to get his samples quickly done he lent to the Laboratory the services of a graduate for over a month. The samples for castor seeds from the Economic Botanist numbered 129.

6. As in previous years a large number of samples came from actual cultivators and from men engaged in agriculture or agricultural industries. The total number of samples received from private persons was 430. This shows that the agricultural public are making full use of the facilities offered by way of analysing their samples and the Chemical Laboratory continues to be as popular as ever. Out of the 430 samples 143 were manures, 115 soils, 52 waters, 39 ghee samples and others were food stuffs, oilseeds, etc. The agriculturists carrying intensive cultivation generally get their manures analysed before buying. This is a good sign of the keen interest they show in their work. This year 39 ghee samples came for analysis. The reason of the unusual number is that nowadays Poona, Bombay and other markets are flooded with vegetable solidified oils which are sold as ghee or are mixed in large proportion with ghee or butter and many people sent samples to ascertain what stuff they were buying.

Investigation work.

7. Investigation of small problems referred to the Agricultural Chemist has been included under analytical work and it is only the larger problems which need mention under the heading " Investigation Work."

8. The study of the buffalo milk casein which was mentioned in the last year's report as completed, has been sent for publication.

9. An experiment to recover orange plants attacked by Die-back disease by digging trenches to improve soil ventilation was started in 1925. That experiment and similar ones taken in later years have all proved to be successful. Two reports on these have already been published. The plants treated in 1925 have not as yet shown any tendency to suffer from die-back.

10. The work on the recuperation of Nitrogen in the Deccan soils has nearly come to completion and some other soils have been taken up for a similar study.

11. The work in connection with manuring of rice at Karjat is being continued. A paper written on " the Assimilation of nutrients by the rice plant " has been accepted for a Departmental Bulletin which will be out before long.

12. Preparation of a suitable manure from waste plantain stems was taken up in the year under report. By chopping the stems and by suitable additions of lime and ammonium sulphate or calcium cyanamide, a good manure could be prepared in less than six months. This is a valuable result when ordinarily the plantain stems take years to rot and turn into a manure.

13. It was reported that onions rot in stores and I was asked to find out the conditions under which rotting takes place and to ascertain what must be done to prevent rotting. The experiments conducted show that if the onions are kept under well ventilated and cool covers the onions do not rot.

14. A study of the " Karla " soils in the Karnatic has been taken up which will be continued in the next year.

15. Effect of Sodium carbonate on trap soils is another new subject which has recently been taken up and which will be continued in the next year.

Teaching.

16. I was responsible for the teaching of chemistry and geology to all the classes at the Poona Agricultural College. The teaching work has become very heavy in recent years and the teaching staff under me get but very little time to devote to investigation work. I am glad to say, however, that every one of them is anxious to do some research work and utilizes fully his vacation for research. In March 1928 one student was admitted to work for the M.Sc. degree of the Bombay University.

Water-finder work.

17. There were three water-finder machines working under me and a fourth one was sanctioned in the year under report. The new machine arrived just after the end of the year. Each machine is in charge of an assistant. Generally one assistant and many times two assistants were sent to take readings on the sites located by Major Pogson and on the reports of the assistants I sent my predictions to Major Pogson. During the year under report 128 sites were tested for him. The chief work of the assistants in charge of the water-finder machines is to locate sites for the public who apply for help. This year 213 sites were tested for the people. A new Bulletin has been published giving up-to-date information on the work of the water-finders in this Presidency.

18. I am glad to say that all my assistants have worked satisfactorily. The office work has increased much due to additional work of water-finders and I have been hoping to get a second clerk for the last two years.

D. L. SAHASRABUDDHE,

Agricultural Chemist to Government,
Bombay Presidency, Poona.

APPENDIX K.

SUMMARY OF THE WORK DONE UNDER THE ECONOMIC BOTANIST TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR ENDING 30TH JUNE 1928.

The undersigned held charge of the post of the Economic Botanist to the Government of Bombay, Poona, during the months of July 27th to October 1927 and June 1928, Dr. Burns the permanent incumbent having been in charge in the remaining 7 months. Mr. Kulkarni acted as Assistant Professor of Botany in the former period.

Education.

(*a*) In the last session the teaching of Botany to the College classes including the Short Course was shared by the Economic Botanist, the Assistant Professor, two Assistant Economic Botanists and one Demonstrator.

(*b*) Thirteen students specialised in Advanced Plant Breeding. Twelve appeared at the examination, 10 passed in the optional subject and 6 passed the whole examination for the degree of B.Ag.

(*c*) Students of both the training Colleges in Poona, (2) the Arboricultural class, (3) Nature Study Club, (4) United Free Church Training College, Poona, (5) Seva Sadan, Poona, (6) Veterinary College were given special demonstrations. Special facilities were provided for certain post-graduate and other students.

(*d*) Exhibits were sent to the Council Hall for the benefit of the members of the Provincial Board of Agriculture who met in September 1927. A fine set of exhibits was arranged at the Agricultural Show held at Ahmednagar in November 1927 and a similar one was arranged at the time of the visit of the Minister for Development, Madras (November 24th, 1927). A plan for a garden in front of the Irwin Museum at Kolhapur was prepared.

(*e*) Lecture notes on Plant Breeding were supplied to the Deputy Educational Inspector for Visual Instructions based on 45 Magic Lantern slides.

(*f*) Two visitors from Foreign Countries, *viz.*, Professor Kotowski of the Warsaw University and Dr. Devoto of the Argentine Republic were shown the botanical work conducted here and also that at Kalas and Karjat.

Seed Testing.

During the year 303 samples of seeds were tested for germination.

Enquiries and Advice.

The number of specimens identified was 522 and enquiries on economic botany were 97.

Seed Supply.

Small quantities of weed seeds of 44 species were collected for use in the experiments of sheep and goat grazing at Badami and sent to the Range Forest Officer there.

Spineless cactus and various seeds were supplied to correspondents as usual.

Researches.

The direction of all botanical work conducted by the Agricultural Department at its various stations was, under instructions of the Director of Agriculture, taken over by the Economic Botanist who also acted as a member of the Indian Central Cotton Committee.

Lantana Research.—Although the big knives (locally known as Koitas) used in the experiments mentioned in the last year's report saved time and labour, the cuts made were jagged and in consequence the majority of the plants so treated were found to be putting forth new shoots. Clean cuts are necessary. Government have now sanctioned the undertaking of one final experiment.

Safflower Research.—The high yielding strain No. 7 was tried in the districts as also in Poona. In the latter place only, the test received statistical treatment. In Poona the strain proved better in yield than local by 17·1 per cent., in Bagewadi it was by 13·6 and in Gadag by 9·4 and in Athani by 40·6 per cent. while in Haitapur (Dharwar District) it was worse by 13·2 per cent. and in Sholapur District by 9 to 13 per cent.

Bajri Research.—The better yielding seven strains selected last year were tried for comparative yield by the chess-board method. The result was the worst variety No. 1-12 and the best variety No. 54 of the seven have given 50 and 99 per cent. respectively higher yield than local and No. 37 gave 66 per cent. higher yield. The results of the duplicate ¼ acre plot trials which included 6 out of the same seven were also found to be promising, as nearly all of them (except No. 1-12 which gave only 1,000 lbs. per acre) have yielded about 1,400 to 1,600 lbs. per acre. No. 54 gave 1,600 lbs. per acre.

It has been decided to try Nos. 54 and 37 and compare with the local and Akola in 16 places in the districts. The chess-board and duplicate quarter acre plot trials are also to be repeated in the following year.

Out of the nine Akola selections only one of them is consistently giving promising results from year to year and hence the latter has been included in the next year's chess-board for comparative yield trial. Awned varieties, pure for the awned character, have been found to be fairly high yielding and their trial will be continued.

Grass Research.

Investigations at Kalas—(1) *Protected and unprotected areas.*—A comparison of the amounts of organic matter, soil moisture and the depth of penetration of water and within and without the fenced area shows the percentage of organic matter 7·75 and 7·21, moisture 10·10 and 8·93 and penetration 13·6 and 10·6 inches respectively. Similarly the average plant population is 2,848 and 1,765 per square metre and the average height of tussocks is 32 and 22 inches respectively. It was also noticed that in the former area the space occupied by stumps of grass per hundred square feet was 6·31 square feet while in the latter it was only 1·77. Protection has therefore markedly improved the grassland.

(2) *Burning.*—Burning is detrimental on poor shallow land, but may be definitely beneficial on rich lands.

(3) *Drainage.*—It has been found undesirable to attempt drainage as erosion results.

(4) *Transplanting.*—Transplanting stumps of perennial grasses has been found to be a method to increase the stand of tussocks of grasses. Success was attained even in poor flat land.

(5) *Rotational grazing.*—Experiments were continued in four places instead of five (the fifth place—Padmavati—was abandoned as the co-operation of the village people only got with great difficulty, was never wholehearted and finally disappeared).

These experiments consist in carrying out of a definite scheme of rotational grazing with a limited number of cattle and the making of botanical and other observations during the course of grazing. The main findings so far for Deccan conditions are :—

(*a*) It is not desirable to allow grazing until two months after the break of the rains.

(*b*) The use of low stone bunds catches soil on which develops an early growth of grass which is readily eaten by cattle.

(*c*) The use of salt helps greatly in the utilisation of the poorer grass.

(*d*) The vegetation improves and the cattle are well nourished.

(3) *Chharodi.*—Experiments in this area have been more or less spoiled by excessive rains and floods of 1927 and so the data so far got are not very convincing.

(4) *Kandivlee.*—The experiment here is of different type. It consists of various methods of treating grass such as for silage, hay and grazing *plus* the limitation of the number of animals grazed and periods of grazing. The whole area is fenced and is divided into five blocks treated in the following ways :—

Blocks I & II	..	Grass cut for silage and then grazed.
Block III	..	Cut for hay in October and then grazed.
Block IV	..	Grazed throughout the year.
Block V	..	Grasses allowed to drop seeds and then harvested and grazed.

The yields of grass have increased and the pasture improved.

Study of Andropogon contortus.—It has been definitely established that there are two sub-species and they are essentially different in morphological characters.

Study of recovering of Andropogon contortus.—Experiments of eradicating *A. contortus* by ploughing were tried at the Tegur Farm. It is found that this species reappears but the progress is very slow.

Determining the feeding value of grasses with the co-operation of Dr. Warth of Bangalore.—Samples of some grass species from different habitats were sent to Dr. Warth for determining the changes in the feeding value.

Castor Research.—The aim of this research is to get a high yielding variety with high oil content. In consultation with the trade we got the commercial valuations of all seed samples that we had and selected 50 which were considered the best from a commercial point of view. One hundred dark-seeded samples were also selected so that should any of these 100 show a higher percentage of oil they might also be cultivated on a large scale. All these were cultivated. Records of their similarities and dissimilarities and morphological descriptions were made. Eight successful crosses were obtained. One hundred and twenty-nine samples were analysed for oil content. Forty of these showing more than 48 per cent. of oil have been selected for further trial.

PUBLICATIONS.

Burns, W.—

(1) "The Art of Plant Breeding." Poona Agricultural College Magazine, Vol. XIX, No. 3, December 1927.

Burns, W., and Kulkarni, L. B.—

"A line survey of grass land with references mainly to rainfall." The Journal of Indian Botanical Society, Vol. VI, Nos. 3 and 4.

Patwardhan, G. B.—

(1) "Hard coated seeds and their vitality." Poona Agricultural College Magazine, Vol. XIX, July 1927, No. 1.

(2) "Research section in the Presidency Agricultural Show, October 1926." Poona Agricultural College Magazine, XIX, July 1927, No. 1.

(3) "An account of the organisation of co-operative cattle grazing at Pimpalgaon." Poona Agricultural College Magazine, Vol. XIX, No. 3, December 1927.

(4) "Two varieties of *Andropogon contortus* Linn." Journal of Indian Botanical Society, Vol. VI, Nos. 3 and 4.

Narayanayya, D. V.—

"The aquatic weeds of the Deccan Irrigation canals." Journal of Ecology (February 1928).

Godbole, S. R., and Deshpande, R. B.—

"Ant-Burrows." Agricultural College Magazine, February 1928.

G. B. PATWARDHAN,
Acting Economic Botanist.

APPENDIX L.

Summary of the work done by the Crop Botanist to Government of Bombay, Poona, for the year 1927-1928.

For convenience of presentation the report is divided into the following sections :—

I. Administration.
II. Rice Breeding Investigations.
III. Wheat Breeding Investigations.
IV. Miscellaneous Activities.

I.—*Administration.*

The undersigned was appointed to the post on the 11th July 1927, the charge being, till then, held by Dr. W. Burns, the then Joint Director of Agriculture. There has been no change in the personnel of the staff, and it is a pleasure to record that all are putting in fairly efficient work. Some additions, in the form of a Graduate Assistant and a Non-graduate Assistant, or a store-keeper, are needed, in order to cope with the increased amount of detailed work, at both the Rice and Wheat Breeding Stations and particularly at the former institution, which is now handling schemes of advanced rice-breeding by the process of hybridisation. The wheat breeding investigations, on the other hand, are seriously handicapped for want of proper environmental conditions, and it is strongly hoped that there would, very shortly, be the requisite transfer of it to its proper tract. The greatest change that is needed is in the office-accommodation of the undersigned. The present tin-shed, where the office now meets, is not an accommodation, but a temporary provision for the same, and immediate relief on this side is very badly needed.

II.—*Rice Breeding Investigations.*

In a general way the season for the rice crop was fairly satisfactory, the total amount of rainfall, at Karjat, for the year under report, being 123·08 inches, as against 120·82 inches, which is the average of the previous three years. For details, it may be said that there was a shortage of rain, during the seedling stage, whereas there was an excess of it, at the time of harvesting. Yet the harm done on both these occasions was rather immaterial. This impression is corroborated by the yield of the seasonal check-plot, which, for the year under report, was 3,560 lbs. per acre, as against 3,088 lbs. per acre, which is the average of the yield of the previous three seasons.

1. Selection Group.

Strain No. K 42, which is, now, the standard strain, is continuing to breed constant to its high degree of performance, as would be seen from the figures given in table No. 1 below :—

Table No. 1 showing the constancy of the behaviour of strain No. K 42.

Strain No.	Yield per plant in the intensive series in grams	Per acre yield under Replication in lbs.	Per acre yield under multiplication in lbs.	Seasonal check plot yields per acre in lbs.
K. 42 for 1927-28 ..	33·48	4,340	3,468	3,560
„ Average of the previous three years.	31·52	4,210	3,584	3,088

High yielding selections done from the local crop from time to time have not been able to surpass S. No. 42. A number of them were also tried this year with the result given in table No. 2.

Table No. 2 showing the yield of the several other selections done from the cultivators' crop compared with strain No. 42.

Strain Nos.	42	225	226	343	344	345	329
Yield per plant in grams.	33·48	36·05	30·54	30·76	30·31	25·49	29·46

About these strains it may be remarked that S. No. 329 is very coarse in grain-size and hence is not worth much in the appreciation of the cultivating public. S. No. 225 has, this year, yielded as good as, or even better than, S. No. 42. It had a fairly encouraging record in years past, and hence, as a promising sample, it would be tested with S. No. 42 by the method of replications next year, and would then be dealt with as it deserves. S. No. 226 is a sample worth some consideration. In consideration of the results of comparative trials, in several series, and for the last four years, there is reason to believe that it would yield about 7 per cent less than S. No. 42. It has, however, a fine grain (79 grains per gram as against 68 grains per gram for S. No. 42) and hence it commands about Rs. 5 per Khandi (1,400 lbs.) more than the S. No. 42 itself. Hence it is much appreciated by the rice-growers of the North Thana District, who have a ready access to the sufficiently sensitive, well-paying, rice-market at Surat. Hence it is proposed to steadily establish that strain in North Thana.

The intermediate strains Nos. 153 and 164 continue to be whatever they are worth; and no type, as yet, could be isolated to surpass them.

The early strain No. 79 continues to be popular in parts of Thana, Nasik and Ratnagiri Districts. In the last-named District, it is also being used with decided advantage as a Waingan (cold-weather) rice crop. But it

does suffer from the storage pest (Sitrotroga cerealella) very badly, and hence its expansion there is getting limited. It is therefore proposed to try another strain No. 184 which ripens the same time as S. No. 79 and gives yield as good, or about as good, as S. No. 79 and has a grain which is decidedly superior to S. No. 79.

2. Hybridisation Group.

F-4 Generation.

Crosses Nos. 6, 10, 12.

Hybridisation was done with the object of combining the earliness of strain No. 164, with the fine grain of strain No. K-39. The following selections, breeding true to the important characters, show the desired combination :—

Table No. 3.

Strain No.	Flowering date	Yield per plant	Grains per gram
		grams	
Parent 164	26/9	21·85 ± ·43	56
Parent 39	5/10	19·90 ± ·39	87
6-36-56	15/9	21·00 ± ·28	87
6-36-86	16/9	21·35 ± ·36	84
10-342-51	13/9	20·50 ± ·34	89
10-342-54	14/9	18·45 ± ·44	82
10-709-49	14/9	20·45 ± ·43	83
12-349-84	18/9	21·10 ± ·41	84

These selections indicate that fineness and lateness are not necessarily linked.

Crosses Nos. 15 & 16.

Hybridisation was done with the object of combining the fine grain of strain No. 39 with the heavy yield of a selection K. O. 37 from the Patni variety. The following selections breeding true to the important characters show the desired combination :—

Table No. 4.

Strain No.	Flowering date	Yield per plant	Grains per gram
Parent K. O. 37	10/10	26·87 ± ·43	44
Parent K 39	5/10	19·90 ± ·40	87
15-371-10	7/10	25·30 ± ·45	79
16-418-25	28/9	24·60 ± ·41	78
16-725-16	4/10	23·15 ± ·40	84

These selections indicate that (1) heavy yield and lateness are not necessarily linked and also (2) heavy yield and coarse grain are not necessarily linked.

F-3 Generation.

Cross No. 36.

Hybridisation was undertaken with the object of distributing harvesting of Kolamba, over the wide range, existing between the early parent S. No. 184, flowering on the 28/8, and the late parent, S. No. 104, flowering on the 16/10. The cultures are in their F3 generation and their purity with regard to the important characters is yet a matter of doubt. The following cases, however, indicate the presence of cultures, having varying dates of flowering, combined with a fairly high yield, compared even with the yield of the standard strain No. K 42. The grain size, however, is not quite so fine, except in a case or so. The underlined cultures seem to be particularly of importance :—

Table No. 5.

Strain No.	Flowering date	Yield per plant	Grains per gram
Parent 184	28/8	14·70 ± ·30	66
Parent 104	16/10	27·60 ± ·51	56
36-950	19/9	25·60 ± ·43	57
36-769	20/9	23·55 ± ·44	53
36-531	22/9	23·35 ± ·58	61
Standard K 42	4/10	26·64 ±	66
36-516	15/10	30·70 ± ·50	68
36-933	19/10	26·71 ± ·50	60

F-2 Generation.

Cross No. 48.

Crossing was undertaken to combine the high yield of standard S. No. K 42 with the fine grain of S. No. 39. The F2 generation from the cross extending over 1,000 plants was grown and was studied in all details. About 32 selections are done showing the desired combination of the parental characters.

Cross No. 50.

Crossing was undertaken to combine the fine grain of strain No. 39 with S. No. 104 which is less sterile, more standing, less shedding and higher

yielding, though it is slightly late, and may be called coarse-grained. The F 2 generation from the cross, extending over 1,000 plants, was grown and was studied. About 32 selections are done answering the desired combinations of the parental characters.

F-1 Generation.

Crossing was done between a selection from the early, high yielding, Bhadas variety, and the fine-grained strain No. K-39, in order to combine earliness, heavy yield and fineness of the parents. In another case, the parents in the cross were the fine-grained, high yielding strain No. 226 and the comparatively early manuring strain No. K-164, in order to improve the yielding capacity of the early type. The crosses are successful.

III.—*Wheat Breeding Investigations.*

The Wheat-crop had an exceptionally favourable season this year on account of the rains in November. Next, sowing the wheat cultures, under plant to plant study, by the tube-method devised by the retired Crop Botanist Mr. R. K. Bhide, secured a high percentage of germination, and the crop grew very well. The rains in the month of February, however, brought on a very heavy attack of rust, especially on the cultures grown at the Ganeshkhind Botanical Gardens, proving once more that the place was not suitable for wheat investigations.

1. The Selection Group.

Strain No. 168.—This strain matures about 10 days earlier than the local crop of the Nasik or Khandesh tract. It has almost the same tillering as the local (5·7 against 5·2), improved by a longer panicle (9·6 c. ms. against 7·8 c.ms.), which is also broader and more compact than the local. It is also taller than the local (77 c.ms. against 72 c.ms.). The broadness of the ear-head is indicated by a comparatively larger grain-size than the local (20 grains per gram against 22 grains per gram), and makes a difference in rates to the extent of Rs. 3 per Palla of 300 lbs. So far as the yielding capacity is concerned, it may be taken to yield about 8-10 per cent. less than the local. Hence as a crop, maturing 8-10 days earlier, it might bring to the cultivator just about Re. 0-12-0 to Re. 1-0-0 more per acre, although its real advantage is on the side of its earliness.

Strain No. 162.—This strain matures at the same time as the local crop in the Nasik and Khandesh Districts. In some cases it had been found to mature slightly later (4-5 days later than the local). It has got a better tillering than the local (6·2 against 5·2), and a longer head than the local (8·8 against 7·8). The quality of the grain, however, is quite superior to the local (20 grains per gram against 22 grains per gram), the yield is distinctly higher than the local to the extent of 12 per cent. This was ascertained this year at the Wheat Breeding Station, Ganeshkhind Botanical Gradens, Kirkee, under the usual process of replications, when strain No. 162 recorded the yield of $88·6 \pm 3·34$ ounces against $78·8 \pm 2·60$

ounces for the local, thus showing a difference of 12 per cent. in favour of strain No. 162 against the local. The difference is significant as the ratio of difference to error is 7·5. Taking this higher yielding capacity and the better rates that the type can command, it may be stated that, this strain would bring the cultivator, on an average, Rs. 10 to Rs. 12 more per acre than the local seed. The seed is appreciated by the cultivators in the Nasik, Nagar and Poona Districts and hence the type would easily spread.

Strain No. 224.—This strain matures about 7 days later than the local. It has a better tillering (7·2 against 5·2), a better panicle length (8·99 against 7·8) and a very compact head with a thick heavy plump grain which is superior to the local (20 grains per gram against 22 grains per gram). It is, however, dwarf in height (67·5 c. ms. against 72·5 c. ms.). In the yielding capacity it is almost as good as local (77·6 ounces as against 78·6 ounces). The real merit lies in its superior grain-size and lustre, as already shown, for which reason it can get about Rs. 4 to Rs. 5 more per Palla of 300 lbs. or about Rs. 10 to Rs. 12 more than the local for an average crop of an acre. The strain was repeatedly tried on the Jalgaon Farm and was found suitable for the Khandesh tract.

The new selections.

A fresh selection of panicles was made by Mr. R. K. Bhide in the year 1926. These panicles were studied under line cultures in the year under report, and about 12 promising lines have been selected showing a probable improvement of 8 to 23 per cent in yield over the local seed, which was grown as check at repeated intervals all through these cultures.

Mention may next be made of the selections of a fresh lot of individual plants from samples of common seed of the Banshi (T. durum Macaroni) variety, obtained from 20 different localities of the Bombay Presidency, and grown under very careful and rigorously uniform conditions on the Farm. These selections number about 100.

Lastly, it may be added that the well-known wheats, from the Bhal tract of the Dholka and Dhanduka talukas of Gujarath, have also been taken up for study, and selections from the standing crop of the cultivator have been made with the object of isolating any types that would give better yields than the local crop.

2. The Hybridisation Group.

All the above mentioned types, however, are liable to suffer from rust. In order, therefore, to breed rust resistance into them the early strain No. 168 was crossed with K. K. 568, a type from *Triticum dicoccum Emmer* known for its high rust resistance. The cross had been in the F4 generation in the year under report, and certain cultures could be secured showing the combination of rust-resistance of one parent with the wheat grains of the other parent concerned in the cross, along with several

cross-combinations of characters giving rise to certain new types which are all briefly described below :—

Table No. 6 describing the rust-resistance selections.

Strain No.	Culture No.	Flowering date	Texture		Colour			Size of kernel per gram grains	Yield per plant in gram
			Rachis	Glumes	Glumes	Awns	Kernel		
	Parent								
1	B 168	4/1	Tough	Easy	Brown	Brown	Yellow	20	8·4
2	K.K.568	21/1	Brittle	Hard	White	Black	Red	21	9·9
3	1—14	16/1	Brittle	Hard	White	White	Yellow	24	6·4
4	1—16	2/1	Brittle	Hard	White	White	Yellow	22	7·0
5	1—19	6/1	Brittle	Hard	White	White	Yellow	24	7·3
6	2—1	7/1	Brittle	Easy	White	White	Red	20	8·9
7	2—4	3/1	Brittle	Easy	White	Black	Red	22	7·8
8	3—5	3/1	Tough	Easy	White	White	Yellow	22	10·1
9	3—22	1/1	Brittle	Easy	White	White	Yellow	20	8·8
10	3—26	29/12	Tough	Easy	White	White	Yellow	22	8·3
11	3—75	6/1	Brittle	Easy	White	Black	Yellow	24	7·0
12	4—23	3/1	Brittle	Hard	White	White	Yellow	22	8·3

As regards the rust-resistance of these cultures it is worth mentioning that the late February rains gave these cultures a very rigorous trial, in that respect, by creating very moist conditions, so much so moist that the ordinary Bansi type suffered very heavily. The Pusa 4 wheat had the patches of rust on it, and even the otherwise highly resistant parent K. K 568 was not altogether free from it. Under such highly rust-favouring conditions, the selections, mentioned above, though varying among themselves for rust-resistance, had definitely less rust than the Pusa 4 wheat which is known for its rust-resistance. These cultures are very interesting and instructive, in so far as. they clearly show the way of getting over the problem of rust-susceptibility of the wheats of any tract, by the process of hybridisation, with the rust-resistant type mentioned above.

IV.—*Miscellaneous Activities.*

The Rice Breeding Station at Mugad near Dharwar, where the undersigned was formerly working as Rice Breeder, was under the scientific control of the undersigned in the year under report, as his successor there was rather new to the work. The operations, there, were personally executed till transplantation of the experimental crop, and subsequently, they were guided by instructions, on the spots at the time of visits on important occasions, and by correspondence whenever that was enough for the purpose. The findings of the year under report only corroborated the previous findings that, there have been certain strains, in both the Mugad and Antarsal varieties that were investigated—strains which did

bring higher yield than the local and were thereforeworth spreading in the tract.

At the instance of the Deputy Director of Agriculture, S. C. D. Poona, the Mohol Station in the Sholapur District was visited and selections from the standing crop of the Maldandi variety of jowar were made with the object of securing certain high yielding types. The crop showed variations under important characters, and there are hopes that selection may successfully lead to the isolation of better yielding types.

Similarly at the instance of the Deputy Director of Agriculture Northern Division Gujarat, the Dohad farm was visited. The existing schemes of maize and wheat work were discussed and plans for the next year's work were laid down.

Departmental Memoir No. 7—Botanical Series—of 1927, standing on the joint name of Mr. R. K. Bhide, retired Crop Botanist and the undersigned, was published in the year under report. It gives in brief the description of the Kolamba variety in the Konkan, the variations met with in it, the methods employed in isolating pure strains, and the important strains themselves that are now spreading in the tract.

S. G. BHALERAO,
Crop Botanist
to Government of Bombay, Poona.

APPENDIX M.

SUMMARY OF THE WORK DONE UNDER THE PLANT PATHOLOGIST TO GOVERNMENT, BOMBAY PRESIDENCY, POONA, FOR THE YEAR 1927-28.

During the year under report Dr. B. N. Uppal held the charge of this office.

Mr. M. N. Kamat acted as Assistant Professor of Mycology, and Mr. J. S. Malelu as Assistant Mycologist.

Education.

The Plant Pathologist to Government was assisted by the Assistant Professor of Mycology and the Assistant Mycologist in the teaching of Plant Pathology at the Poona Agricultural College.

There were seven students specialising in Plant Pathology, and this was the largest class that we have ever had. The teaching work was consequently very heavy; but I am glad to say that the work done by the members of the staff was very satisfactory, although they were carrying an unusually heavy research programme. I may repeat here what I said in my last report that the section is under-staffed and that a whole-time lecturer in mycology should be appointed so that our research work may not suffer.

There was one post-graduate student under training throughout the year. He was forced to leave his work uncompleted on account of personal reasons; but this work has been taken over by one of the members of the staff.

At the end of the year three students applied for admission to the post-graduate course in mycology; but on account of limited facilities available, only one was taken up. However, by arrangement with the Director of Agriculture, Bombay, another student has been admitted, who has been asked to investigate an obscure disease of chillies which shows itself in the reduced size of leaves, etc.

Research.

In spite of the heavy duties of teaching, the members of the staff have had a very successful year as regards research. The results of these investigations are of considerable economic and scientific value. I feel great pleasure in complimenting those engaged in these investigations and hope that with increasing interest and sustained efforts they will be able to achieve still better results.

1. *Sulphur treatment for grape vine mildew.*—Experiments on the application of sulphur dust in the control of the powdery mildew of grape were continued on a much larger scale than last year. The objects of these experiments were to determine—

(*a*) The economic value of sulphur dusting as compared with Bordeaux mixture treatment.

(*b*) The minimum number of applications for effective control.

(*c*) Efficiency of the different types of dusting machines.

(*d*) Effect of adulteration on the efficacy of sulphur dust in controlling mildew.

The results may be summarised as follows :—

(*a*) If sulphur is applied at the proper time, it is possible to get 100 per cent. control of the disease.

(*b*) Four applications are necessary for the most effective control.

(*c*) "Crank" or "fan blower" type of dusters are much superior to the "bellows" type of dusting machines. Among the crank type of dusters available in India, the Peerless Dust Gun is probably the best.

(*d*) Adulterated sulphur (9 parts of sulphur and 1 part of inert substance) is as efficacious in controlling the diseases as pure sulphur.

The maximum cost of sulphur dusting amounts to Rs. 10; whereas Bordeaux mixture treatment costs Rs. 75. The difference in the cost of the two treatments, coupled with greater yield resulting from the complete control of the disease with sulphur dusting, will result in an annual saving of about Rs. 2,00,000 to grape growers in the Bombay Presidency.

2. *Control of jowar smut.*—This work was undertaken to ascertain whether it was possible to replace the present method of copper sulphate steeping by a dust system, since the former method has proved irksome to cultivators, especially in areas lightly affected by smut. The following fungicides in dust or powder form were used : (1) Copper carbonate ; (2) Sulphur No. 1 (passed through 100-mesh sieve) ; (3) Sulphur No. 2 (passed through 250-mesh sieve) ; (4) Copper sulphate No. 1 (coarse powder) ; and (5) Copper sulphate No. 2 (passed through 200-mesh sieve). The results of these experiments show that copper carbonate, copper sulphate (passed through 200-mesh sieve) and sulphur, all in dust form, can control jowar smut. Sulphur, however, is very promising as it costs less than *one pie* to treat enough grain to sow one acre, and is much easier to apply.

Further experiments on the effect of sulphur and copper carbonate treatments on yield and germination of the seed are being conducted on the College Farm, Poona.

Mr. S. S. Salimath, Deputy Director of Agriculture, Southern Division, is carrying out trials on a very large scale in his division, and similar arrangements have been made in the South Central Division.

3. *Artificial infection of bajri by Sclerospora graminicola.—Sclerospora graminicola* causes a disease in bajri known as downy mildew. Although the disease has been well known for a long time, it was not known until now as to how the fungus lives from year to year and causes infection of bajri plants. Our work has now definitely shown that oospores of this fungus cause infection of bajri in the seedling stage. Infection was readily secured when oospores were placed either on the seed or in the soil, under conditions favourable for their germination. In a completely saturated atmosphere, sporulation on infected leaves occurs within five

to six hours at temperatures from 15° to 20° C. The optimum temperature for sporulation is 15° to 17° C.

Similar experiments are also being conducted with jowar, maize and rala; but until now all attempts at artificial infection of these hosts by oospores have been unsuccessful.

4. *Potato Fusaria.*—In the Bombay Presidency, potatoes are subject to two important diseases, the wilt of the potato plant and the dry rot of the tuber. The question whether each of these diseases is caused by a distinct species of Fusarium and how these forms are related with one another has been much discussed. An investigation was started to throw some light on these points.

The results obtained so far indicate that a species of Fusarium isolated from a wilted potato plant, *F. radicicola* and *F. coeruleum* can produce typical "khoka" (dry) rot. In the tubers inoculated with *F. trichothecioides*, *F. oxysporum* and a species of Fusarium isolated from a "khoka"-affected tuber, the symptoms of the dry rot produced were not well developed; but they resembled more or less the symptoms of the dry rot (khoka) in the early stages.

Further work on this problem is being continued.

5. *Brown spot disease of rice in Sind.*—As a result of the disease survey carried out by the Plant Pathologist to Government, Bombay, in Upper Sind in 1926-27, it was found that the brown spot disease of rice, caused by *Helminthosporium oryzae*, was perhaps the most serious disease of rice in that area and was responsible for considerable damage to the crop. It is hoped that a full-time research worker will be appointed next year to make a detailed investigation into this disease. In the meantime, experiments on the disinfection of rice seed with various organic mercury compounds and other fungicides have been started on the Government Agricultural Farm, Larkana. The results of these experiments will not be available until next year (1928-29).

6. *Chilli diseases.*—In the Deccan and Karnatak, chillies suffer from several diseases which cause considerable damage amounting, in many cases, to a total failure. In order to find out as to which of these diseases is the most serious to justify a detailed intensive study of it, a survey was made of these diseases in the important chilli tracts of the Presidency. The observations thus made lead us to conclude that the most serious disease of this crop as yet observed in these areas is an obscure disease, probably the mosaic disease of chillies, which shows itself in reduced size of leaves, rolling of upper leaves, etc. It has also been found that under field conditions thrips and mites appear to be the principal, if not the sole, agents for the spread of the disease.

An investigation into this disease has been started under a special arrangement with the Director of Agriculture, Bombay Presidency, Poona.

7. *Gummosis of citrus trees.*—The work done so far has shown the efficacy of carbolic acid in the treatment of gummosis. Creosol, furfural, etc., are also being used for the same purpose.

The following experiments are also under way :—

(*i*) Varietal resistance of citrus to gummosis.

(*ii*) Relative resistance of scion and stock to gummosis.

(*iii*) Relation of the height of budding to infection by gummosis.

Advisory work.—A large number of enquiries regarding plant diseases were received from the officers of the Department and the public, and advice was given promptly whenever required. Besides taking care of the enquiries, our activities embraced the following :—

(*i*) Demonstrating the efficacy of sulphur dusting in the control of grape in cultivators' gardens.

(*ii*) Treating citrus trees affected by gummosis.

Publications.

(*i*) Uppal, B. N., and Kamat, M. N.—
Artificial infection of *Pennisetum typhoideum* by *Sclerospora graminicola*. Agricultural Journal, India. (Accepted for publication.)

(*ii*) Uppal, B. N., and Malelu, J. S.—
A preliminary report on experiments in the control of Grain Smut of jowar (*Andropogon sorghum*). Agricultural Journal, India. (Accepted for publication.)

(*iii*) Kamat, M. N.—
The control of Mosambi (*Citrus aurantium*) gummosis. Agricultural Journal, India. XXII : 176-179. 1927.

(*iv*) Control of the anthracnose of grape. Bombay Department of Agriculture Leaflet No. I. 1928.

(*v*) Control of the red rot of sugarcane. Bombay Department of Agriculture Leaflet. (In press)

(*vi*) Control of the powdery mildew of grape. Bombay Department of Agriculture Leaflet. (In press.) Revised.

B. N. UPPAL,

Plant Pathologist to Government.

APPENDIX N.

Summary of the work done by the Soil Physicist to the Government of Bombay during the year 1927-28.

The undersigned held charge of the office of the Soil Physicist to the Government during the year under report except for three months and eighteen days from 26th February 1928 to 14th June 1928, when he was transferred to Poona to take charge of the post of the Agricultural Chemist to the Government of Bombay, when Rao Bahadur D. L. Sahasrabudhe had gone on leave on average pay. During this period Rao Saheb B. P. Wagholkar, Deputy Director of Agriculture, S. C. D., Poona, held charge of the post of the Soil Physicist in addition to his own duties.

The important problem of Dry Farming continues to be chief investigation work that is occupying the time and attention of the Soil Physicist and his limited staff. The year under report happens to be the fourth year for trial with the Rabi crop while it is only the third year for experiments with the Kharip crops. Some additional experiments were tried this year both with Kharip and Rabi crops and the experience gained during the year corroborates the results and the conclusions of the previous year's experiments.

Season.—The total rainfall at the Dry Farm Station at Manjri amounted to 22·03 inches, which is only about an inch more than the average of the place for the last 20 years. But if we look to the distribution of the rain we find, that though the monsoon made a very good beginning in June and gave practically the usual average rainfall in July, there was a long spell of dry weather during the whole of August and the early part of September. This resulted in affecting the standing Kharip crops adversely, especially on account of the crops being either in flowers or in milk stage. This resulted in having low yields of Bajri crop. Out of the total rainfall of 22·03 inches during the whole year, only 11·23 was received till the middle of September while the remaining 10·80 inches came during the Rabi season mainly coming in September, October and November. The Rabi rains were thus sufficient and well distributed. There were more effective or useful rains during the Rabi season than the Kharip.

The results of the Kharip and the Rabi crops are to be interpreted in the light of the above climatic factors.

Kharip crops.—Bajri and Tur mixture.—Bajri is the chief Kharip crop with which experiments are carried out at the Dry Farm. This is the third year for experiments with Bajri. The Dry Farm methods mainly involve thorough cultivation of land, consisting in one ploughing, 3 harrowings, bunding and four interculturings during the crop growth.

The previous year's series of bunding, mulching and spacing were repeated this year and to these cultivator's plot was added for comparison. The results obtained were as follows :—

Bunding and mulching series. Plot	Yield of Bajri grain lbs. per acre	Yield of fodder lbs. per acre	Yield of Tur grain lbs. per acre
Flat and one inch mulch	768	2,448	910
Bunds and one inch mulch	783	3,126	1,132
Bunds and two inch mulch	854	3,254	940
Cultivator's plot	545	3,456	815

The results clearly indicate the advantages of the application of Dry Farming methods for a Kharip crop. The plot which was laid down for imitating cultivator's conditions stands last in the yield of grain.

In addition to the above experiments, the series to determine suitable distance between plants was carried out.

The results indicate that under this year's climatic and rainfall conditions closer planting or higher seed rate gives better yield, provided the land received thorough preliminary cultivation and subsequent interculturings.

Rabi-crop—Jowar.—The year under report is the fourth year for experiments with Rabi-jowar. These experiments are carried in a more elaborate manner in triplicate plots.

General cultivation of land.—The land received deeper ploughing with a gallows plough. Bunding, seven harrowings during rains and four interculturings gave the following results :—

Results of Experiments with Rabi-jowar

Treatment of plots	Yields of grain lbs. per acre	Yields of straw lbs. per acre
No Bunds and 1″ mulch	1,133	2,767
Bunds and 1″ mulch	1,535	3,355
Bunds and 2″ mulch	1,386	3,359
Cultivator's plot	565	3,866

The results indicate that placing in bunds to prevent run-off and mulching by repeated stirring of the soil resulted in giving very high yields of grain as compared with the yield of the cultivator's plot. They indicate the possibilities of improving the present very low yields obtained by the ordinary cultivator even in a year of favourable rains.

Economic Series.—An experiment to study the economic effect of the improved method was carried on half an acre, keeping an account of

the expenses for all items. The results indicated that the total value of the produce from one acre was about Rs. 72 while the expenses amounted to Rs. 42, thus leaving a net profit of Rs. 30 per acre.

Experiments in the Districts.—At Ahmednagar, bajri and jowar crops were grown for the District Show and gave nearly 2½ times greater yields than the local plots.

At Mohol experiments on the Government Farm and on a cultivator's field again gave far higher yields than the local plots.

At Barsi again on the fields of Mr. Sulakhe, the yield of jowar by Dry Farm method was nearly 33 per cent. more than the local method. Lastly at Jategaon two cultivators who tried the Dry Farm method got twice the yield of grain as compared to their local method.

Propaganda work in the District.—Lectures and Demonstrations on Dry Farming were given at Bombay, Ahmednagar, Bijapur, Wai, Mohol and four or five places in the Eastern Division of the Poona District.

Publication.—Bulletin No. 142 on "Dry Farming methods in the Deccan" describes the results of three years' work at Manjri. Leaflet No. 25 on "Dry Farming in the Deccan" has been published in English and also in Marathi. A Note on Dry Farming was published for the Provincial Board of Agriculture and a paper on the same subject was sent to the Indian Science Congress.

Laboratory Work.—Soil moisture study occupies most of the time of the limited staff. The study of other soil properties cannot make much progress with the present staff.

Staff.—The only graduate assistant Mr. G. M. Bapat, M.Ag., has again worked very satisfactorily during the year. The non-graduate fieldman still continues to be temporary. There is an urgent need for more hands for any satisfactory progress of the Dry Farming Problem.

N. V. KANITKAR,

Soil Physicist to Government of Bombay.

APPENDIX O.

Summary of work done by the Live Stock Expert to Government for the year 1927-28.

Charge.—This section of the Agricultural Department remained under the charge of Mr. E. J. Bruen.

During the year under report the Willingdon Cattle Farm, Phihai, Malir (Sind), was handed over to the Deputy Director of Agriculture, Sind; the Live Stock Expert, however, still advises the farm on its breeding policy. The Tapti Khillari Farm situated at Sangvi, Shirpur Taluka of West Khandesh District, was handed over by the Shirpur Cattle Breeding Association to the Agricultural Department, and is now under the control of the Deputy Director of Agriculture, N. C. D., with the Live Stock Expert as adviser. The Agricultural Department is now working on farms with the following breeds:—The Sindhi, the Kankrej, the Tapti Khillari, the Gir and the Amrit Mahal (Halikar) breeds. No farms or institutes are provided for the Dangi, the Krishna Valley and the Mhaswad Khillari (Central Deccan).

The work of the Live Stock Section covers the following:—

I. Advisory work to private and public Dairies, Dairy farms and cattle breeding and cattle protection institutes.
II. Propaganda and teaching in villages.
III. Breeding of certain types of pure breed cattle on Government farms and public institutes co-operating with Government.
IV. The placing of pure breed good bulls bred on Government farms into areas, where facilities exist for the raising of good stock, and the people are keen and have a knowledge of the keeping and raising of livestock.
V. Demonstrations and Shows.
VI. Sheep Improvement.
VII. Poultry Improvement.

Advisory Work.—The visiting and advising of Panjrapoles and Gowshalas was continued. The principal new institute taking advantage of these visits was the Karachi Panjrapole, who are carrying out the advice given, and have already appointed a Manager selected by this Department. The whole institute has been reorganised with a result that the milk yield of the institute has increased from 200 lbs. of milk a day to 450 lbs. a day. Up-to-date methods of selling milk have been introduced. The Dakor Temple Committee have asked for advice. The work undertaken at Kandivalee is now beginning to take effect, and the advice of the Live Stock Expert is being sought by all the institutes in the Presidency.

More intensive work on commercial Dairy farming is essential, but it is difficult to advice in this direction with no adequate control on the production and selling of milk and its products. The large Dairy farmer stands no chance in this industry with the smaller cow or buffalo keeper,

who has no compunction of adulterating his milk. The first essential to good pure milk production on sound commercial lines is legislation on the production and distribution of all milk and its products.

Propaganda.—The Live Stock Expert with his three Divisional Inspectors visited as many villages in the breeding areas as was possible, teaching the people how to breed and care for their cattle. Owing to a shortage of travelling allowance grants a great deal of work that might have been done, was not undertaken. The numerous requests from all sections of the community all over the presidency to deliver lectures at public function demonstrates the popularity of this section. During the year a new form of propaganda by magic lantern was introduced with the aid of the Gogras Gojivan Mandal, Bombay. Over two hundred villages were visited and lectures delivered. Assistance was given to numerous taluka development associations, cattle shows, as also to the District Agricultural Show, Ahmednagar.

Premium Bulls.—The demand for Premium bulls far exceeds either the out-put from farms or purchased bulls from grants allotted for the purpose. Numbers of applications for bulls could not be met. The demand for bulls from the Northcote Cattle Farm, Chharodi, is now so heavy, that it is feared that more strict rules will have to be instituted and only those who are able to make very good use of bulls to raise more pure bred stock be given the advantage of the Chharodi bred stock. A demand has arisen from Indian States and foreign countries, who are now prepared to pay large sums for Chharodi bred stock. Fifty bulls were put out, *vide* Appendix A.

Demonstrations and Shows.—During the year only two Cattle Shows were actually held by this Department, one at Kandivalee (Bombay) and the second at Mahud Budruk (District Sholapur). These Shows have taken on wonderfully well, and a sense of friendly rivalry and competition has taken hold of the people. The purchase of good stock of the right type for showing purposes is being carried on; thus introducing into the area good animals. Silage demonstrations were conducted in 11 different places in Ahmedabad, Surat, East and West Khandesh, Bombay, Satara, Sholapur, Belgaum and Dharwar districts.

Sheep.—There is no doubt whatsoever that there are great possibilities in the improvement of the sheep of this Presidency, a large part of which although not suited to the raising of cattle, with advantage will carry a much improved sheep than that which we see to-day.

It is difficult however, to advise the way this improvement should be brought about, as no really scientific investigation has been carried out. In the interests of this industry it is advisable that a sheep breeding experimental farm be instituted at an as early a date as possible. The sheep in the Presidency are poor producers of wool and meat, and are very prone to disease. Whether this is due to the poor quality of the stock or whether it is due to in-and-in breeding, it is difficult to say. Again there is the point of disease, which needs investigation as little is known of the sheep diseases in this Presidency.

A start has been made on the improving of the sheep by the introduction of grade Merino Rams bred on the Hissar Farm, Punjab. Results so far obtained on Rao Saheb Mangsoli's farm in Athni are encouraging. The yield of the wool has been doubled, and the price obtained is a good deal better than local wool. The great difficulty, however, is that these Rams have died, some within a few months of their arrival and other within a year. Just what these Rams died of it is difficult to ascertain, but it is presumed that their management has been bad and the Rams have exhausted themselves being kept constantly with ewes.

Twelve Rams were purchased with the help of the Anti-Famine Institute and placed through this agency in Bijapur District. The Rams after travelling for 3 weeks in the train arrived in Bijapur in an exhausted condition and when some sheep disease was prevalent, with a result that 6 of the Rams died within a month of arrival. Five of the remainder died within six months and one is still alive. The progeny born to these Rams are a distinct improvement on the indigenous sheep. It is, however, fairly certain that before any general improvement can be brought about, some scientific research is needed.

Poultry.—An attempt was made this year to improve the village fowl by the introduction of improved white Leghorn cocks and the method employed was to purchase from members of the Bombay Presidency Poultry Association cocks at a cheap figure, *i.e.*, Rs. 5 per cock. These were placed out into villages in 3 different areas :—

I. In 2 talukas of Satara District through the Sangli Industrial School.
II. In Baramati villages through the Criminal Tribes Settlement Mission.
III. Through the Anti-Famine Institute, Bijapur, into a couple of villages of each taluka.

In this manner some 60 White Leghorn cocks have been placed into these villages. From reports received from Mamlatdars and others and my own personal inspection, the results so far achieved are very encouraging; the people have taken very kindly to this method of improving their poultry and the movement is popular.

In addition to this we have placed with the Settlement Mission in Baramati 6 pure bred hens and one cock, eggs from these are sold at one anna each to villagers for hatching. The demand cannot be met and villagers are now trying to purchase pure bred stock, which unfortunately are expensive.

One villager in Belgaum District purchased 6 white Leghorn hens and one cock; in 19 months he has 300 hens and 150 cocks after having sold Rs. 400 worth of birds and Rs. 80 worth of eggs, with a total expenditure of Rs. 117-8-0. Even the Brahmin has taken to poultry farming. We have several successful Brahmin poultry breeders in Poona and Satara districts.

Inquiries for advice and purchase of birds are coming in daily, and the work in this connection is getting very heavy.

Northcote Cattle Farm, Chharodi.

Staff.—The farm was under the management of Mr. M. M. Desai throughout the year with Mr. M. G. Patel as Assistant Manager.

Season.—The season was abnormal throughout; the rains started late with an unprecedent fall of 81 inches in July. The normal rainfall of the farm is about 36 inches, whereas during the year 104·73 inches were recorded. This deluge meant certain damage to crops and buildings. The livestock escaped wonderfully well, only two casualities being recorded.

Hay-making.—The heavy rains and consequent stagnation of water instead of damaging the hay crop, it proved a really good year for hay, the farm harvesting 12,50,302 lbs. of hay as against the next best year 12,12,128 lbs. and the total cost of harvesting and stacking was again low being Rs. 2-2-1 per 1,000 lbs., although labour was scarce and expensive being employed on flood relief works.

Ensilage.—During the year 6 pits of silage were made containing 4,72,765 lbs. of green grass and jowari at a total cost of Rs. 468 excluding cost of the material or roughly about Re. 1 per 1,000 lbs.

Breeding herd.—The policy laid down was continued during the year. Each year shows a distinct improvement in the milking capacity of the herd. During the year 1,16,763 lbs. of milk were produced as against 1,04,832 lbs. the year previous and no milk in the year 1918. The attached statement (*vide* Appendix B) gives one an idea of what can be done, and what has been done at Chharodi. With a herd which was never milked, within 7 years the average yield has been increased from 438 lbs. to 1,400 lbs. per lactation.

The first and most important problem before us has been early maturity. Twenty-four heifers calved for the first time during the year and the average age at first calving is 4 years and 2 months, as against 18 calving the year previous at 4 years and 5 months. The usual age at first calving was 6 years when we first took over the farm. One heifer calved at the age of 2 years and 8 months and what is more milked extraordinarily well. The powers of transmitting early maturity is being carefully watched and certain families are now showing a distinct advantage over others. During the year the highest yield recorded was 5,924 lbs. and next best yield was 4,552 lbs.

Regularity of calving.—During the year 95 calves were born from 128 cows, as against 96 calves born the year previous from 181 cows, showing that our second object of regularity of calving is gradually improving.

Death.—The death rate is gradually decreasing, this year only 21 deaths being recorded, 16 of which were small calves.

Sale.—During the year 182 animals were cast and sold at a total of Rs. 7,842, the majority of these animals were useless. The demand from States and from other Governments is on the increase. Nine animals were sold at considerably over book value. There is no doubt that the excellence of the Chharodi cattle is now attracting attention.

Bulls.—During the year 13 bulls were put out on our Premium System *plus* 4 bulls sold at Rs. 225 each and 3 bulls at Rs. 350 each, making a total of 20 in all.

Fodder Crops.—Sixty acres were sown to Kharif jowar during the year. The excessive rain and lodging of water destroyed a very promising crop. Four acres of Bajri was totally destroyed. As a winter crop a mixture of oats and peas were sown at short intervals to ensure obtaining a regular supply of good green fodder for part of the winter, 2 acres and 35 gunthas of this mixture yielded at the rate of 16,965 lbs. of green fodder per acre.

Elephant grass as a permanent crop is down in ½ an acre of land well irrigated and yielded during the year at the rate of 26,013 lbs. per acre.

Visitors.—The farm is being patronized more and more each year by persons interested in the cattle of the country.

Experiments.—Chharodi Farm does not lend itself to carrying out experiments as the farm was never built for this purpose, and owing to financial stringency no additions to cope with such work has been added.

The following experiments were conducted during the year :—

I. To determine the amount of concentrate ration necessary to working bullock when fed ample good hay.

II. The value of green oats and field peas as a fodder.

III. To ascertain quantity of concentrates necessary for Kankrej cows in milk when on green grazing.

IV. To ascertain the loss in body weight after calving.

Flood relief work done by Chharodi Farm and the staff.

I. On hearing of the extensive damage done in neighbouring villages, the staff were ordered to visit villages and offer help.

II. The farm staff helped with advice and the farm supplied free of charge 5 pairs of bullocks to the most needy, which helped considerably in resowing crops.

Mr. M. M. Desai has worked well throughout the year, especially so during the floods.

Cattle Breeding Farm, Bankapur.

Staff.—The breeding farm was under the management of Mr. A. B. Gadagker, G.B.V.C., throughout the year.

Season.—The season on the whole was very fair as far as good grazing and fodder crops were concerned, although owing to the long break towards the end of the monsoon season, the poorer varieties of grass predominated over the better grasses.

The newly acquired land at Kalasgeri stood the farm in good stead supplying grazing for the whole herd for two months and the total hay requirements of the farm. Greater advantage of this area could be taken if buildings for the menials necessary were provided. This however has not been possible owing to financial stringency.

Hay and Silage-making.—This year a grass-mowing machine was introduced on the farm, being used for making hay on the Kalasgeri

site. A slight saving in cost was made, this will improve each year as the labour gets familiar with this machine.

Small bunding operations on the grass areas proved very useful. It is hoped to be able to extend this experiment as much as possible, not only being beneficial to the grass crop, but it will also help level up the land to enable the mowing machine to be used more extensively. A fair amount of clearing work has been done this year, all of which helped towards a better and cheaper harvest.

Breeding herd.—The farm now has a herd of 167 animals, the maximum it can possibly carry. It has now become necessary to cast rigorously to keep the herd down to this number. The percentage of male births on the farm was 40 per cent. and 59 per cent. female as against 58 per cent. males and 43 per cent. females in the year previous. The stud bull at the farm has a tendency to throw excellent female stock, but his male progeny are not quite so good. A number of bulls have been tried out but little permanent success has been achieved, showing the very poor state of the purity of the Amrit Mahal breed. Another bull will be purchased this year.

Breeding programme.—The Amrit Mahal being a purely draught breed, the improvement of the breed apart from physique lies in producing an animal that will calve early, and then calve regularly. The farm has succeeded in this aim in so much that heifers are now taking the bull at from 2½ to 3½ years of age.

Sale.—During the year 32 animals were cast as of no further use to the farm and sold for Rs. 1,400.

Premium bulls.—During the year under report only two bulls were given out on the Premium System, the reason for this being that it has been found that when bulls are given out at too young an age, they are not given sufficient attention to help them put on growth and yet be useful. A policy has been adopted that no bulls under 3½ years of age will now be given out and hence the small number issued. The farm has now 43 young bulls, many of which will be fit to go out towards the end of the year. Each bull is now being tested before leaving the farm on village stock brought on to the farm for service. During the year 76 cows from villages were served on the farm. To prevent too great a demand for service a fee of Re. 1 per service is now being levied, which the people are only too pleased to pay.

Milking Experiments.—As previously stated the Amrit Mahal is a non-milker, being a purely fast medium draught animal. However, it is necessary that the cows should yield more milk, both in the interests of the calf and the owner. The aim is not to produce a Dairy animal but a good draught animal, the female progeny of which will give even a small quantity of more milk for its calf and a little surplus for household consumption, thereby making it a more economical animal. The attached statement (*vide* Appendix C) gives an idea of the success so far achieved in this direction. It will be seen that there are possibilities in the contention that even draught breeds will when properly bred and fed give some milk.

Disease.—The only disease which appeared on the farm was Black-Quarter, which claimed 8 deaths. The herd had recently been protected against this disease and yet the disease occurred. The animals were given further immunity by inoculation. The total death rate from all causes works out to 4 per cent.

Petty Construction.—With the growth of the herd more accommodation was necessary; for this purpose a shed measuring 60′ by 21′ made of cutcha walls with iron roof was built at a total cost of Rs. 638, thus providing accommodation for 22 animals.

Water supply.—During the year a power pumping plant has been installed. This arrangement although it gives a good supply of water is rather expensive as the motive power used is an old white oil engine. It is hoped in the near future to replace this with a cheap running crude oil engine.

Fodder Crops.—The site of Bankapur Farm is an old fort and the land undulating having numerous drains and inner motes. However, during the year 9 acres and 24 gunthas were brought under cultivation as against 6 acres and 7 gunthas the year previous. The land produced 69,000 lbs. of jowar green fodder, which was fed to cattle green, and a little over 1 lac lbs. of jowar and maize was converted into silage. The making of silage was demonstrated on the farm and at one place in Shigaon Taluka, both of which were taken advantage of by the cultivators.

General.—The Manager, Mr. Gadagker put in good work during the year.

Co-operation of the Bombay Gowrakshans at Kandivalee and Mulund.

The Bombay Gowrakshak Mandali's Gowshala at Kandivalee :—

Government are co-operating with this institute in the interests of cattle and Dairy farming improvement. In the Presidency there are many such institutes, one in every large town, whose object has been to offer a refuge to animals whose owners either cannot keep them, or that have been saved by town dwellers from the slaughter houses.

These institutes are very well supported by the Hindu and Parsi communities and having been inaugurated centuries ago, command very good sites and have large areas of grazing either donated or acquired, when land was cheap. Among the many useless cattle given asylum, many are equal to the best available in the Presidency. Thus it will be seen from all points essential to cattle improvement, *i.e.*, cattle, sites and finance, these institutes offer an excellent opportunity to improve the cattle of the country, if managed and run on honest, clean and scientific lines.

It was to promote and spread this idea that the authorities of this institute offered to co-operate with Government, so as to enable us have a demonstration institute. This institute has now been running under Government supervision for 4 years, and the results attained, although not financially good have been a distinct improvement, and the institute

is now useful to the country. The institute was divided into two separate departments :—

I. The Improved Breeding and Dairy Department.
II. The Asylum for the blind, maimed, etc.

This co-operation has been able to prove that a good breed, such as the Gir can be maintained in the heavy rainfall tracts of the Presidency. The cattle have actually improved and the yields of milk have increased each year as will be seen from Appendix D attached. There has been shown how cattle and Dairy records should be maintained, how cattle should be fed, the care of cattle in health and disease, how grass and grazing lands should be managed, and how by holding an annual show the knowledge acquired can be disseminated.

Annual Show and Demonstration.—The first Show held in 1925, even with the attraction of His Excellency the Governor's presence attracted 63 entries with a maximum yield of 16 lbs. of milk for the best cow shown. In 1928, 168 entries were attracted and the highest yield recorded was 24·4 lbs. in a day. In 1925 only 6 cows entered in the milk test, whereas in 1928, 26 cows were entered. Thousands of people attended the Show, which was acclaimed by all and sundry as a huge success. Authorities from many similar institutes from States and from Sindh have visited the institute and it is now a pleasure to have to say that even the more orthodox institutes are following in the footstep of this gowshala.

Breeding Policy.—Great strides have been made in our breeding stock, more milk, early maturity and regularity of calving are making headway.

The farm has had bad luck with disease, but this was to be expected and each year their condition is improving.

Silage.—Silage is made on a large scale and is demonstrated whenever occasion arises.

General.—The authorities Mr. Motilal Kanji Kapadia, B.A., LL.B., J.P., and Sheth Rao Saheb Harjivan Valji, J.P., together with their energetic hard working Secretary Mr. Nanalal T. Tarkas are to be congratulated on this achievement; and should receive recognition for this pioneer work, which they have successfully conducted against great odds.

Nathoo Lalji Charity Trust Fund.

Gowshala at Mulund.—The work at this Gowshala is carried on, on exactly the same lines as the Kandivalee Gowshala. The results achieved are nearly equally as good. Here we are experimenting with fodder grasses, suitable for low lying marshy land. The experiment although being conducted for 3 years has not been successful owing to damage by stray cattle.

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX A.

The following Premium bulls and breeding-bulls were put out during the year :—

Name of breed	Number distributed	Remarks
Kankrej	31	
Gir	2	
Nimar	9	
Dangi	2	
Amrit Mahal	2	
Mhaswad Khillar	2	
Sindhi	1	
Surti	1	Buffalo-bull.

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX B.

Statement showing the marked progress in yielding capacity of Kankrej herd at Chharodi within the period of 7 years.

Serial No.	Year	Average number of cows during the year*	Number of animals milked	Percentage of animals milked over the total number of cows during the year	Number of animals yielding 1,500 lbs. and above during the year	Percentage of animals of 1,500 lbs. and over to the total number of cows	Annual average yield per animal milked	Remarks
				Per cent.		Per cent.	Lbs. ozs.	
1	1921-22	231	100	43	6	2·6	438 11	Milking operations were begun in December 1920.
2	1922-23	158	69	44	4	2·6	637 11	
3	1923-24	194	67	35	13	6·7	827 7	
4	1924-25	204	109	53	16	7·8	932 11	
5	1925-26	173	93	54	32	18·5	1,330 14	Seven cows in milk were sold.
6	1926-27	181	109	60	28	15·4	1,074 1	Three good cows suffered from disease during the year that greatly affected their yield.
7	1927-28	128	90	70	33	25·6	1,400 0	

**Note.*—The average figure for number of cows during the year is arrived at by taking the number o c ows in the beginning of each month of the year and striking its average for that year.

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX C.

(Milking Test of Farm born cows (Bankapur).

Serial No.	Name of cow	Brand number	Number of days milked	Quantity yielded	Date when commenced	Date when stopped
				Lbs. ozs.		
1	Prayaga ..	62	22	125 14	7th July 1927 ..	29th September 1927.
2	Uma ..	41	179	1,656 12	Do. ..	1st January 1928.
3	Vranda ..	58	72	656 10	Do. ..	16th September 1927.
4	Vetravati ..	64	158	1,761 8	28th July 1927 ..	1st January 1928.
5	Droupadi ..	44	46	215 14	19th January 1928.	5th March 1928.
6	Arunditi ..	70	46	176 4	Do. ..	Do.
7	Naisani ..	73	63	296 0	Do. ..	Continued.
8	Vaijayanti ..	109	46	165 4	Do. ..	5th March 1928.

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX D.

Comparative Yields (Monthly) of cows and calvings for the years :—

Kandivalee Gowshala.

Month	Yield in lbs.	Number of cows calved	Yield in lbs.	Number of cows calved	Yield in lbs.	Number of cows calved
	1925-26		1926-27		1927-28	
April	3,082·8	2	3,709·4	1	4,760·0	3
May	2,893·12	2	4,027·12	2	5,584·8	6
June	2,546·8	1	4,963·12	..	5,374·8	1
July	2,219·0	..	4,575·8	1	5,391·12	3
August	1,966·4	..	3,295·8	..	4,723·4	5
September	2,522·0	4	2,926·8	2	4,269·4	..
October	3,115·8	3	2,601·4	3	3,609·12	..
November	4,001·0	1	2,231·8	..	3,718·4	3
December	2,854·12	3	2,573·12	3	3,725·4	..
January	2,993·8	2	3,140·12	2	3,478·12	2
February	2,773·0	4	3,285·4	6	3,526·12	4
March	3,330·0	5	4,486·8	6	3,984·0	8
Total ..	33,297·12	27	41,817·4	26	52,146·0	35

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX P.

Summary of work done under the Agricultural Engineer to Government, Bombay, Poona, for 1927-28.

I held charge of the office of the Agricultural Engineer to Government for a period of five and half months during the year under report and Mr. C. G. Paranjpe acted for me during the remaining period whilst I was on leave in England.

The work of the Department has been divided between Modification of Implements, Boring, Site Survey, Training of Oil engine students, Pumping, Workshop and experimental well and General inspection of machines and Advisory. The principle activities being Boring and Modification of Implements. It was decided in October 1927 that the Boring work conducted by the Agricultural Department should be transferred to the Executive Engineer, Boring Works, Nasik, and controlled by him independently. The transfer however has not been effected and boring activities so far as Agricultural matters are concerned still remain under mine and the Deputy Director of Agriculture's control.

The Department possesses 87 boring machines in all and these are distributed throughout the Presidency, 30 of which are worked by the Deputy Directors of Agriculture with the assistance of 5 Boring Assistants; the Agricultural Engineer acting as consultant in technical matters, breakdown and fishing operations and the remaining 57 machines are worked directly by the Agricultural Engineer with the assistance of two Boring Overseers. Some of the machines are loaned to District Local Boards, some to Native States and some are worked for cultivators through the Agency of the Revenue Department. This is a most complicated system and leads to endless delay and confusion and in many cases misunderstanding likely to result in disputes rather difficult to settle. Real progress is therefore greatly hampered partly by unsuitable rules and partly by inadequate staff. If it is decided to retain these boring activities with the Agricultural Department, it is absolutely essential to simplify the whole system and bring it under one head, *viz.*, the Agricultural Engineer. This Department has been conducting boring operations since 1913, hence many problems have been mastered by my staff and the physical conditions and mechanical difficulties are understood and if given the proper inspecting staff and a simplified system of working I am assured a much better outturn can be guaranteed and I question if the transfer will either increase the efficiency or reduce the cost unless an increase of staff and simplified system is adopted.

The modification of implements has had, as much of my personal attention as I could possibly give and whilst my absence on leave did not tend to expedite matters in India, I made it a point when in England of visiting Works at my own expense so as to prepare the field for further experiments on my return to duty. Every effort, however, was made, during my absence on leave, to carry on the work of perfecting

seed-drill, winnower and groundnut raiser; and I am indebted to my Assistant and staff for their untiring effort in carrying on the work during my absence.

Advisory Work.

There were 121 enquiries on technical matters, 33 of which were for pumping, 46 for boring, 6 for cane crushing, 12 for tractoring, 2 for oil industries and 22 of a general nature. 20 pumping sites on rivers were inspected for the purpose of irrigation schemes, 7 of which were for growing fodder as a measure against famine. 20 estimates of pumping and other schemes were furnished to parties interested and 73 drawings and sketches were made by the drawing office in dealing with schemes and departmental problems.

Special efforts were made to inspect as many Government machines in the Presidency as possible including machinery under the Deputy Directors of Agriculture with a view to ascertain their condition and output and take steps to improve the efficiency wherever necessary and possible. Thus 24 Power Boring Machines in the divisions together with machinery at ten Government Farms were inspected. The condition of some of the machines in the divisions was in a very unsatisfactory state as a result of their not being repaired and driven properly. This has revealed the fact that in the interest of Government property periodical inspection by a highly technical Officer is absolutely essential and steps are being taken to improve the situation as far as practicable with the present staff.

The oil engine driving class attached to the Workshops was in operation during the whole year and 14 cultivator students have had the benefit of its tuition.

The Deputy Director of Agriculture N. C. D., Nasik, has been advised on a second chaff-cutting portable plant for experiments in his division which comprised a 5 B.H.P. Petter Semidiesel Crude Oil Engine driving a Richmand and Chandlar type B.G.A. Chaff-cutter. Both the machines are mounted on a steel trolley for easy transport. Recent trials of this combination indicate that the plant deals with 800 lbs. of kirbi per hour or 6,400 lbs. per day of 8 hours and consumes about 3·5 lbs. liquid fuel per hour. The output and consumption should be greatly improved when the operators get conversant with the working of the plant.

Experimental and Research Work.

Seed Drill.—The improved seed-drill has passed through several phases of modifying and altering with a view to make it more efficient, universal and up-to-date. The present drill has a much larger seed box capable of dealing with three-quarter to one acre of land at one filling. The wheels, the scrapers and the seed cups are greatly improved and flexible conveyors have been introduced to carry the grain from seed box to ground in place of the old Bamboo tubes with a view to prevent choking of seeds. An appliance is attached behind the drill for covering the seed after sowing and at the same time cutting off any late growth of weeds.

This is operated by the driver with his foot. The main beam is so constructed that any spacing of the coulters is now possible. Another provision is now made to serve the purpose of harrowing prior to sowing. Further the two land wheels and axle are arranged so as to give the effect of a differential gear and assist in turning at the ends of the field. The yoke is also greatly improved and it is not necessary now to lower the axle for carrying the drill from field to field. Hence the latest model is a combination of a light plow, drill and harrow and effects the three operations simultaneously. I think this is a distinct advance in improved indigenous implements and by using this seed drill the estimated saving is from Rs. 4 to Rs. 6 per day.

Ground-nut raiser.—A Potato Digger has been converted so as to perform the operation of raising ground-nuts and was tried at Narayangaon in Junnar Taluka on Spanish pea-nut with a fair amount of success, resulting in digging an acre of ground-nut at a cost of Rs. 2-13-0 to Rs. 3-12-0 per acre against Rs. 4-2-0 to Rs. 7-2-0 per acre by hand labour. The implement requires exhaustive trials on other varieties of ground-nuts and in different soils and improvements effected in the implement to deal with varying conditions.

Winnower.—Another winnower received from the Deputy Director of Agriculture, Gujrath, is modified and improved to our standard model and the construction of two more machines is in hand for demonstration purposes.

Saw Gin.—Experiments with a power saw gin were conducted at Jalgaon Farm with a view to ascertain whether short staple or N.R. Cotton can be effectively and efficiently dealt with without damaging the fibre and the seeds. The machine was tried at different speeds ranging from 250 to 500 revolutions per minute against 400 revolutions stated by the Makers. These saw gins deal with more cotton and turn out very clean lint and do not break the seeds like the roller gins. They, however, retain from 1 to 1 and half percentage more lint than the seeds produced by the roller gins. It was noticed that at high speeds ranging from 500 to 600 revolutions per minute the fibre is less affected. The experiment will be repeated next season with a view to decide whether the saw gins can really be made useful for dealing with short staple cotton as a business proposition.

Boring Tools.—Experiments conducted in connection with boring prove that Blue Lable Steel is more efficient for boring in rock than the ordinary Miner's drill steel, as it lasts longer and requires 50 per cent. less fettling. The special drilling jars made at Dapuri Workshops seem to stand quite well. They are, however, in an experimental stage and require further improvements and trials. Having these made here, however, is a distinct advantage as hitherto we had to send to United States of America for Jars. The fixing of the wire rope hoist on the Musto Power Machine seems to have solved the difficulty of an efficient power driven sand line arrangement. Further experiments are necessary in order to demonstrate this view and then install these hoists on other drills.

Experiments with the newly designed expanding bit in conjunction with the Calyx Core Drill, especially when drilling in stiff clay have proved that the casing pipe can be lowered with very little difficulty.

Executive Work.

Nangaon Pumping Plant.—The Nangaon Pumping Plant on river Bhima in Poona District worked for 3,000 hours during the year and irrigated 278 acres and 20 gunthas of land which realised Rs. 5,853-11-3. The total expenditure inclusive of the permanent staff amounted to Rs. 11,244-0-4. Although the loss to Government is much less than last year, the results are not by any means up to expectations. The chief reason being that the demand for water this year was slightly reduced as we irrigated about 94 acres 30 gunthas less than the previous year. Secondly the condition of the channel was not very sound and consequently the area irrigated per day was reduced in some cases by 50 per cent. for instead of irrigating 6 to 9 acres per day we irrigated on some days only 3½ to 7 acres. The distribution of water was managed by the irrigation society at Nangaon who do not seem to be inclined to continue the work any further. It appears to be advisable to entrust such work to a body having sufficient experience of water distribution, with a view to effect economy and avoid unnecessary loss.

Karajgi Plant.—In accordance with Government Orders this plant was not worked last year. The usual repairs required to be done during the off season have been completed including the fixing of the long arm to the weigh-bridge. The old timber frame of the Bruiser which had become very rickety has been replaced by a steel frame specially built at the Public Works Department, Central Stores and Workshops, Dapuri, and it is anticipated that the vibrations and stoppages on the machine will be reduced to a minimum in future.

Erection of Pumping Plants.—Four Pumping Plants have been installed during the year under report as detailed below :—

(1) *Bankapur Farm.*—A bore-hole power pump has been fixed on the 3″ bore at Bankapur Farm and driven by belt through a countershaft from the Farm engine. The water is carried to a tank built on the old silo tower situated at a distance of about 1,400′ from whence the water gravitates to the byres and quarters. The total head against the pump is 80′ approximately and its discharge is 700 gallons per hour.

(2) *Mr. Saswadkar's Plant.*—The 7 B.H.P. Tangye engine and the 3″ Tangye pump loaned to Mr. Saswadkar of Poona at Shitaphali baugh have been returned to the shops and a new 17 B.H.P. Blackstone Spring Injection type crude oil engine with a new 4″ Pulsometer Centrifugal Pump type "A" have been installed on his well at his own cost. The total lift is 50′ and the delivery of the pump at this head amounts to 425 gallons per minute. The Plant irrigates 4 to 4½ acres per day.

(3) *Tube well pump at Sakrand station (Sind).*—A Krough 9″ tube well Turbine Pump was sent to Sind and fixed on the 10″ tube well at Sakrand Station. Before despatching, however, it was first

demonstrated and tried on a well at Modibaugh in the College grounds, Poona. The old 4″ Pulso-meter Centrifugal Pump fixed in a sump on this tube well was practically burried owing to the collapse of the sump sides and had to be taken out and the 10″ casing brought to ground level. The Turbine Pump was then lowered into the Tube well to a depth of 59′-7″ and sealed on the top to prevent foreign matter falling in. The driving head is supported on 2 cross girders and channel pieces and driven from the extended countershaft by a quarter twist belt drive. The pump is submerged to a depth of 33′-1″ so as to get the full benefit of recouperation. The pump discharges into a masonry tank situated at a distance of about 50′ for irrigation purposes and also into an iron tank on an elevated tower about 20′ for drinking purposes. The capacity of the pump ranges from 273 to 324 gallons of water per minute.

(4) *Rajewadi Plant.*—A new Pumping Plant on the river Nira at Rajewadi, District Satara, is fixed for Mr. Mohite partly for drinking and partly for irrigation purposes. The plant consists of a 2″ high lift Pulso-meter Centrifugal Pump type B driven by an 8 B.H.P. semi Diesel type verticle Petter Crude Oil Engine, which is driven from one end of the countershaft, and a 1½″ Myers double acting reciprocating power pump with enclosed type gear is fixed for drinking purposes and is driven from the other end of the countershaft. The pumps work alternately. The Centrifugal Pump delivers about 90 to 100 gallons of water per minute at 100′ total head.

The plunger pump has to force water to a height of 130′ through a length of 3,200′ of 1½″ pipe line. The total head roughly amounts to 200′ and the pump delivers 12 to 13 gallons of water per minute.

Plants on hire.—The 14·4 B.H.P. Clayton engine still remains on hire with Mr. Supnekar of Karad. The 4 B.H.P. Combined Pumping Set with the 2½″ Gwynnes Pump loaned to Mr. Javalgikar of Sholapur was returned by him and then sent to Alandi for the Kartiki Fair for the Sanitary Engineer to Government and thence given on loan to Mr. Javalekar of Poona. The 3 B.H.P. combined set with the Aquatole lift was sent to Nagar for the District Show. Afterwards it was sent to the Lloyd Polo Club for some days for emptying the swimming bath. The 7 B.H.P. Tangye engine and 3″ Tangye pumping plant loaned to Mr. Saswadkar of Poona was sent to Karanjgaon to empty a big tank. It was then loaned to Messrs. Gokhale and Kalbhor at Theur and Loni respectively. The bore-hole power plant was sent to Karmala and Inchalkaranji for testing bore-holes. The hire actually realized amounts to Rs. 879-4-5. The above is an indication that the cultivators are desirous of adopting power pumping.

Repairs and service rendered.—The G-3 Calyx drill at Kandivali was completely overhauled by this Department for the Deputy Director of Agriculture, Konkan Division. The repairs consist of the following:—

(*a*) The old hind wheels of the trolley were replaced by smaller wheels of the standard size of the F-3 drill and the front axle arrangement redesigned.

(*b*) The three throw pump and the hoist were completely overhauled and a relief valve fitted.

(*c*) The old drill head was fitted with a sliding base specially made at Dapuri complete with gear, ratchet, etc.

(*d*) The drill spindle, the main drive shaft, etc., have been renewed and the circulating pump of the engine put in working order.

A fitter was also sent to repair and overhaul a Musto Power Machine in Khandesh for the Deputy Director of Agriculture, N.C.D., Nasik, and a man sent to Mr. Rupchand Balaram of Jalgaon to assemble a second-hand case tractor and put it in working order.

Boring.—The demand for boring was greatly affected due to good rainfall last year and consequently we were not able to keep all our machines fully employed. It was with great difficulty we could keep 29 machines (21 hand and 8 power) going in different parts of the Presidency. The total number of bores made was 136, 75 of which are found to be successful according to our standard of success, *viz.*, 200 gallons or more per hour for 8 hours continuously. Twelve were stopped at the request of the owner, 10 are on hand and 35 containing a little water, the balance of 5 was dry.

A statement giving details of the bores made is attached separately.

Tarpedoing.—A ten pound charge of high explosives (Blasting Geletine) was fired in each of the two 4″ bores 100′ deep made at Akol in Belgaum District as per request of the Deputy Director of Agriculture, S. D., Dharwar, with a view to increase the quantity of water tapped.

The result was, however, unsatisfactory.

General.

The total receipts of the Department including hire charges of plant, service rendered to the public and materials supplied from Stores and boring receipts amount to Rs. 6,658-13-5.

The 4 pumping plants sent to Ahmedabad last year for the Show had to be sent back to Poona owing to the postponing of the Show on account of floods. One pumping plant has, however, been returned to Ahmedabad to pump water for the Show Crop Court.

We are shortly having a small air lift plant for the Experimental Well and Workshop, where the lifting of water from bore-holes and from sumps and wells will be demontrated in a practical manner.

I feel it my duty to place on record the great help rendered by my Assistant and Staff during the year under report.

W. M. SCHUTTE,

Agricultural Engineer to Government,

Bombay Presidency, Poona.

MO 4 58—15

Statement showing particulars of Famine Pumping Sites in the Bombay Presidency approved *out of the total number of 7 sites inspected during the year 1927-28.*

Serial No.	District	Taluka	Village	River	Area available in acres
1	Bijapur ..	Bagalkot ..	Anagwadi ..	Ghataprabha ..	60
	Do. ..	Do. ..	Do. ..	Do. ..	120
2	Do. ..	Bilgi-Peta ..	Galgali ..	Krishna ..	64

Serial No.	District	Approximate total lift in feet	Size of pump and power of engine required for area	Remarks
1	Bijapur ..	41′	6″ Pump and 26 B.H.P. crude oil engine.	Fairly good.
	Do. ..	,,	8″ pump and 45 B.H.P. engine.	
2	Do. ..	54′	6″ pump and 38 B.H.P. engine (Crude oil.)	Fair.

W. M. SCHUTTE,

Agricultural Engineer to Government of Bombay, Poona.

Poona, 20th July 1928.

STATEMENT OF BORES
FOR 1927-28

No. 9—58—15a

Statement of Bores

Serial No.	Name of the Owner	Survey No.	Village	Taluka
	Poona District			
1	Mr. Govindas Narayandas ..	City limit ..	Poona ..	Haveli ..
	Nasik District			
2	Mr. Shankar Laxman Deokar ..	Not known ..	Nandgaon ..	Nandgaon ..
3	,, Bansilal Gangaram Marwadi.	357	Sakora ..	Do. ..
	West Khandesh District			
4	The District Local Board ..	D. L. B.'s Office ..	Dhulia ..	Dhulia ..
	Surat District			
5	The Taluka Local Board ..	Gaothan ..	Bhatpur ..	Chorashi ..
6	Do. ..	Do. ..	Do. ..	Do. ..
	Panch Mahals District			
7	Political Agent, Rewakantha ..	Near Timber Road Station.	Gothada ..	Godhra ..
	Ahmednagar District			
8	Mr. Gokuldas Kalyanji ..	2	Ahmednagar ..	Ahmednagar ..
9	Do. ..	2 ..	Do. ..	Do. ..
10	Agricultural Show ..	Show grounds ..	Do. ..	Do. ..
	Sholapur District			
11	Proprietor, Karmala Ginning Factory.	Factory ..	Karmala ..	Karmala ..
	Satara District			
12	The Taluka Local Board ..	Gaothan ..	Dalmodi ..	Vadus ..
13	Do. ..	458	Pusesavali ..	Do. ..
14	Do. ..	Gaothan ..	Gepuj ..	Do. ..
15	Do. ..	Do. ..	Goregaon ..	Do. ..
16	Do. ..	Do. ..	Chorad ..	Vaduj ..
17	Do. ..	Do. ..	Samdoli ..	Tasgaon ..
18	Do. ..	Do. ..	Do. ..	Do. ..
19	Do. ..	Do. ..	Tnug ..	Do. ..
20	Do. ..	Do. ..	Do. ..	Do. ..
	Bijapur District			
21	The Taluka Local Board ..	Gaothan ..	Hulgeri ..	Badami ..
22	Do. ..	72	Bankeri ..	Do. ..
23	Do. ..	99	Do. ..	Do. ..
24	Do. ..	Gaothan ..	Malagi ..	Do. ..
25	Do. ..	78B	Do. ..	Do. ..
26	Do. ..	7	Radder Timmapur.	Do. ..

for 1927-28

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
3"	43' 0"	*Nil.*	260	Successful.
3"	44' 6"	200	1,000	Do.
3"	60' 0"	340	2,000	Do.
6"	132' 6"	*Nil.*	Feeble current.	Unsuccessful.
				Total depth 291'-0".
6"	31' 0"	500	*Nil.*	Stopped due to mishap and piping withdrawn.
6"	66' 4"	500	750	In progress. Brakish water being tapped.
6"	75' 0"	100	150	Unsuccessful.
6"	189' 6"	*Nil.*	40	Unsuccessful.
6"	170' 0"	*Nil.*	40	Do.
6"	21' 0"	*Nil.*	*Nil.*	Stopped as the Show was over.
3"	2' 0"	*Nil.*	*Nil.*	Stopped at owner's request.
3"	8' 6"	*Nil.*	20	Unsuccessful.
3"	60' 0"	*Nil.*	250	Successful.
3"	61' 0"	*Nil.*	250	Do.
3"	62' 6"	*Nil.*	250	Do.
3"	60' 0"	*Nil.*	250	Do.
3"	12' 0"	*Nil.*	250	Do.
				Total bore 60 feet.
3"	55' 0"	*Nil.*	No water ..	Unsuccessful.
3"	40' 0"	*Nil.*	*Nil.*	Stopped due to mishap.
3"	89' 0"	*Nil.*	100	Unsuccessful.
3"	130' 0"	*Nil.*	No water ..	Unsuccessful.
3"	75' 0"	*Nil.*	No water ..	Do.
3"	106' 0"	*Nil.*	250	Successful.
3"	23' 0"	*Nil.*	10	Unsuccessful.
3"	36' 6"	*Nil.*	250	Successful.
3"	65' 8"	*Nil.*	Feeble current.	Unsuccessful.

Serial No.	Name of the Owner	Survey No.	Village	Taluka
27	The Taluka Local Board ..	33	Baddes Timmapur.	Badami ..
28	Do. ..	Gaothan ..	Navaraspur ..	Bijapur ..
29	Do. ..	Do. ..	Do. ..	Do. ..
30	Do. ..	City limit ..	Bijapur ..	Do. ..
31	Do. ..	339	Jalgeri ..	Do. ..
32	Do. ..	Gaothan ..	Sirual ..	Do. ..
33	Do. ..	Do. ..	Morabgi ..	Do. ..
34	Do. ..	Do. ..	Dorga ..	Do. ..
35	Do. ..	Do. ..	Do. ..	Do. ..
36	Do. ..	Do. ..	Kakhandki ..	Bijapur ..
37	Do. ..	Do. ..	Do. ..	Do. ..
38	Do. ..	Do. ..	Do. ..	Do. ..
39	Do. ..	City limits ..	Bijapur ..	Do. ..
40	Do. ..	Do. ..	Do. ..	Do. ..
41	Mr. Shivappa Aminappa ..	18	Chiraldinni ..	Bagewadi ..
42	,, Bhimangauda Sidramappa ..	3	Do. ..	Do. ..
43	,, R. M. Kulkarni ..	482	Neelgund ..	Badami ..
44	,, Channappa Dnyanappa ..	78	Do. ..	Do. ..
45	Village Panchayat ..	179/19	Kardiguda ..	Do. ..
46	Mr. Shivaseaswa Swami ..	28	Shivayogmandir	Do. ..
47	,, Krishnappa Dohappa Naik .	2	Amalzari ..	Bilgi ..
48	Do. ..	Do. ..	Do. ..	Do. ..
49	Mr. M. S. Deshpande ..	144	Nagaral ..	Do. ..
50	,, Gangappa Basappa ..	75	Kopp ..	Do. ..
51	Do. ..	75	Do. ..	Do. ..
52	Do. ..	75	Do. ..	Do. ..
53	Mr. Gangappa Gadigeppa Patil ..	30	Do. ..	Do. ..
54	,, Bhimacharya Venkatacharya.	Not known ..	Nimbal ..	Indi ..
55	Dr. Patil	77	Bagalkot ..	Bagalkot ..
56	Mr. Pandappapattar ..	192	Balganur ..	Sindgi ..
57	,, Shivappa Bhagappa Bableshwar.	544	Do. ..	Do. ..
58	The Taluka Local Board ..	Gaothan ..	Kadni ..	Do. ..
59	Do. ..	Do. ..	Do. ..	Do. ..
60	Village Panchayat ..	Do. ..	Mortgi ..	Do. ..

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
3"	74' 2"	*Nil.*	*Nil.*	In progress.
3"	50' 0"	*Nil.*	*Nil.*	Unsuccessful.
				Total depth 63 feet.
3"	50' 0"	*Nil.*	*Nil.*	Unsuccessful.
3"	56' 0"	*Nil.*	250	Successful.
3"	17' 0"	*Nil.*	250	Do.
3"	31' 3"	*Nil.*	Feeble current.	Unsuccessful.
3"	22' 3"	*Nil.*	250	Successful.
3"	60' 0"	*Nil.*	Feeble current.	Unsuccessful.
3"	58' 0"	*Nil.*	250	Successful.
3"	50' 0"	*Nil.*	250	Successful.
3"	35' 0"	*Nil.*	250	Do.
3"	40' 0"	*Nil.*	250	Do.
3"	66' 0"	*Nil.*	Feeble current.	Unsuccessful.
3"	2' 6"	*Nil.*	*Nil.*	In progress.
3"	16' 0"	300	Feeble current.	Unsuccessful.
3"	14' 0"	200	Feeble current.	Do.
3"	22' 0"	*Nil.*	250	Successful.
3"	12' 0"	*Nil.*	250	Do.
3"	56' 0"	*Nil.*	250	Do.
3"	27' 7"	*Nil.*	*Nil.*	In progress.
3"	19' 3"	*Nil.*	1,000	Successful.
3"	13' 6"	*Nil.*	1,000	Do.
3"	4" 0"	400	*Nil.*	Stopped at owner's request.
3"	11' 0"	60	*Nil.*	Do. do.
3"	12' 0"	60	600	Successful.
3"	18' 0"	660	1,200	Do.
3"	42' 6"	660	*Nil.*	Stopped at owner's request.
3"	12' 6"	200	*Nil.*	Do. do.
3"	14' 0"	*Nil.*	*Nil.*	Do. do.
3"	12' 6"	*Nil.*	260	Successful.
3"	14' 1"	1,000	2,000	Do.
3"	25' 0"	Not known	Feeble current.	Unsuccessful.
3"	28' 0"	50	250	Successful.
3"	58' 6"	*Nil.*	Feeble current.	Unsuccessful.

Serial No.	Name of the Owner	Survey No.	Village	Taluka
61	The Taluka Local Board ..	Gaothan ..	Mortgi ..	Sindgi ..
62	Do. ..	Do. ..	Do. ..	Do. ..
63	Mr. Bhimappa Ranalappa Patil .	14	Do. ..	Do. ..
64	,, Irrappa Sindlingappa ..	156	Do. ..	Do. ..
65	,, Shivaronappa Irappa ..	Gaothan ..	Mangrul ..	Do. ..
66	The Taluka Local Board ..	Do. ..	Sosbal ..	Do. ..
67	Do. ..	Do. ..	Algur ..	Do. ..
68	Do. ..	Do. ..	Do. ..	Do. ..
69	Do. ..	Do. ..	Yalgod ..	Do. ..
70	Mr. Ayappa Adinappa Patil ..	395	Kalkeri ..	Do. ..
71	The Taluka Local Board ..	Gaothan ..	Kudergoud ..	Do. ..
72	Do. ..	Do. ..	Kalkeri ..	Do. ..
73	Do. ..	Do. ..	Turokangeri ..	Do. ..
74	Do. ..	35	Sirur ..	Bagalkot ..
75	Do. ..	198	Manikatti ..	Do. ..
76	Do. ..	2	Manikeri ..	Do. ..
	Dharwar District			
77	Mr. G. S. Kulkarni ..	Gaothan ..	Alagwadi ..	Navalgund ..
78	,, Malangouda Jirlappa Patil ..	162	Hebbal ..	Do. ..
79	,, Hussein ..	Gaothan ..	Bankapur ..	Shiggaon ..
80	,, Vankatesh Jagnath Kulkarni.	Do. ..	Do. ..	Do. ..
81	,, S. G. Kulkarni ..	Do. ..	Do. ..	Do. ..
82	,, B. C. Advani Math ..	Do. ..	Do. ..	Do. ..
83	,, B. D. Bhanikatti ..	Do. ..	Do. ..	Do. ..
84	,, Martandrao Kulkarni ..	Do. ..	Belavatti ..	Hangal ..
85	,, S. R. Deshpande ..	Do. ..	Aladkatti ..	Do. ..
86	Do. ..	Do. ..	Do. ..	Do. ..
87	Mr. B. G. Patil ..	65	Uggengeri ..	Kalghatgi ..
88	,, K. Y. Patil ..	Gaothan ..	Hire Honehalli ..	Do. ..
89	,, Chanbeergowda Patil ..	Gaothan ..	Taredhalli ..	Ranibennu ..
90	,, Ujjangowda Patil ..	Do. ..	Kamdod ..	Do.
91	,, Bhimappa Sankappa Bankar.	190	Shrigambhi ..	Hirekerur

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
3"	33' 0"	*Nil.*	Feeble current.	Unsuccessful.
3"	27' 0"	*Nil.*	Feeble current.	Do.
3"	51' 0"	800	Feeble current.	Do.
3"	31' 6"	60	Feeble current.	Do.
3"	9' 2"	800	*Nil.*	Stopped at owner's request.
3"	31' 0"	160	Feeble current.	Unsuccessful.
3"	50' 0"	*Nil.*	250	Successful.
3"	29' 6"	*Nil.*	150	Unsuccessful.
3"	48' 0"	*Nil.*	250	Successful.
3"	34' 0"	120	370	Do.
3"	50' 0"	*Nil.*	Feeble current.	Unsuccessful.
3"	48' 8"	100	Feeble current.	Do.
3"	11' 0"	Not known	*Nil.*	In progress.
6"	83' 0"	*Nil.*	60	Unsuccessful.
				Total bore 90 feet.
6"	113' 0"	*Nil.*	Feeble current.	Unsuccessful.
6"	155' 0"	*Nil.*	*Nil.*	In progress.
3"	69' 6"	*Nil.*	250	Successful.
3"	30' 0"	200	Feeble current.	Unsuccessful.
3"	7' 6"	*Nil.*	260	Successful.
				Total bore 60 feet.
3"	28' 0"	30	2,000	Successful.
3"	55' 0"	*Nil.*	250	Do.
3"	30' 0"	20	1,000	Do.
3"	50' 0"	*Nil.*	250	Do.
3"	16' 0"	*Nil.*	250	Do.
3"	40' 0"	300	1,000	Do.
3"	3' 3"	*Nil.*	*Nil.*	In progress.
3"	17' 6"	*Nil.*	260	Successful.
3"	65' 0"	*Nil.*	50	Unsuccessful.
3"	36' 0"	60	400	Successful.
3"	28' 3"	*Nil.*	400	Do.
3"	51' 0"	*Nil.*	250	Do.

Serial No.	Name of the Owner	Survey No.	Village	Taluka
92	Mr. Veerappa Keshappa Chanbassappa.	Gaothan ..	Chikkerur ..	Hirekerur ..
93	The Taluka Local Board ..	Do. ..	Maged ..	Ranibennur ..
94	Mr. K. G. Malagi ..	Do. ..	Halgeri ..	Do. ..
95	Do. ..	Do. ..	Do. ..	Do. ..
96	Mr. Modinsale, Peersale ..	Extension area ..	Ranibennur ..	Do. ..
97	Do. ..	Kabarstan ..	Do. ..	Do. ..
98	Mr. B. T. Guddad ..	24 ..	Do. ..	Do. ..
99	„ Rango Venkatesh ..	Gaothan ..	Do. ..	Do. ..
100	„ S. S. Hassangadi ..	98	Do. ..	Do. ..
101	„ Kotrabassappa Virbasappa .	Gaothan ..	Do. ..	Do. ..
102	„ Dilleppa Hucheppa ..	67	Kakol ..	Do. ..
103	Do. ..	Do. ..	Do. ..	Do. ..
104	Do. ..	Do. ..	Do. ..	Do. ..
105	Mr. Lingappa Neelapakotur ..	281	Do. ..	Do. ..
106	„ Shivappa Mallapa ..	Gaothan ..	Kajari ..	Do. ..
107	„ Bharamapa Holiyapa Bankar.	Do. ..	Do. ..	Do. ..
108	„ K. A. Dixit ..	1	Narganpur ..	Dharwar ..
109	Do. ..	1	Do. ..	Do. ..
110	Mr. G. K. Jadhav ..	City limit ..	Dharwar ..	Do. ..
111	„ Anapa Rajapa Anavabar ..	155	Kadkol ..	Haveri ..
112	„ V. B. Kumbhar ..	85	Do. ..	Do. ..
113	„ Kalapa Veerbhadrapa ..	Gaothan ..	Do. ..	Do. ..
114	„ V. B. Kumbhar	85	Do. ..	Do. ..
115	„ Ramapa K. Gunjal ..	Gaothan ..	Do. ..	Do. ..
116	„ Govindapa Bhimapa ..	73	Shirbadgi ..	Do. ..
117	„ Mahadeoapa Basapa ..	3	Medur ..	Hirekerur ..
118	„ Yadneshwar Dixit ..	Gaothan ..	Hirekerur ..	Do. ..
119	„ Rudrapa Nagabond ..	Do. ..	Do. ..	Do. ..
120	Do. ..	Do. ..	Do. ..	Do. ..
121	Mr. Yadneshwar Dixit ..	Do. ..	Do. ..	Do. ..
122	„ Shivangowda Sanbasapagouda.	Do. ..	Aladgeri ..	Do. ..
123	Government Dispensary ..	Do. ..	Hirekerur ..	Do. ..
124	Mr. Girbasapa Murigepa Shiggavi.	69	Gandanhall ..	Haveri ..
125	„ Murijeku Kalyanapa Nelaigi.	Gaothan ..	Kattanhalli ..	Do. ..
126	„ Gurudapa Basapa ..	57	Do. ..	Do. ..

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
3"	20 6"	*Nil.*	*Nil.*	In progress.
3"	21' 0"	200	1,000	Successful.
				Total bore 60 feet.
3"	4' 0"	*Nil.*	260	Successful.
3"	16' 0"	*Nil.*	250	Do.
3"	67' 4"	*Nil.*	250	Do.
3"	63' 0"	*Nil.*	250	Do.
3"	51' 6"	*Nil.*	*Nil.*	In progress.
3"	31' 0"	*Nil.*	250	Successful.
				Total bore 41 feet.
3"	33' 6"	*Nil.*	250	Successful.
3"	49' 0"	*Nil.*	250	Do.
3"	6" 0"	*Nil.*	*Nil.*	Stopped due to technical trouble.
3"	8' 1"	170	670	Successful.
3"	12' 0"	170	670	Do.
3"	61' 0"	300	1,300	Do.
3"	32' 0"	10	260	Do.
3"	36' 0"	*Nil.*	260	Do.
3"	65' 0"	*Nil.*	No water	Unsuccessful.
3"	65' 0"	*Nil.*	Do.	Do.
3"	65' 0"	*Nil.*	50	Do.
3"	35' 0"	90	1,000	Successful.
3"	16' 6"	60	310	Do.
3"	26' 0"	*Nil.*	1,000	Do.
3"	51" 0"	180	1,080	Do.
3"	15' 0"	*Nil.*	250	Do.
3"	37' 0"	30	1,200	Do.
3"	40' 0"	200	1,000	Do.
3"	50' 0"	*Nil.*	250	Do.
3"	25' 6"	*Nil.*	250	Do.
3"	7' 9"	*Nil.*	*Nil.*	Stopped due to technical difficulties.
3"	25' 6"	*Nil.*	250	Successful.
3"	27' 0"	*Nil.*	1,000	Do.
3"	94' 0"	*Nil.*	250	Do.
3"	50' 0"	187	437	Do.
3"	17' 6"	30	260	Do.
3"	62' 0"	Not known	2,500	Do.

Serial No.	Name of the Owner	Survey No.	Village	Taluka
127	Mr. Karepa Dodmallapa Arabgoudanor.	4	Kattanhalli ..	Haveri ..
128	,, C. C. Hulkoti ..	211	Mugad ..	Dharwar ..
129	The District Local Board ..	Goathan	Do. ..	Do. ..
	Ichalkaranji State.			
130	State Work	75	Shiradwad ..	Ichalkaranji ..
131	Do.	Hava Mahal Bungalow.	Ichalkaranji ..	Do. ..
132	Do.	River Bed ..	Do. ..	Do. ..
133	Do.	Do. ..	Do. ..	Do. ..
134	Do.	Do. ..	Do. ..	Do. ..
135	Do.	Do. ..	Do. ..	Do. ..
136	Do.	Gaothan ..	Shirdhon ..	Do. ..
				Total number of
				Total Footage
				Total number of gallons

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
3"	31' 7"	312	625	Successful.
6"	90' 0"	*Nil.*	250	Do.
6"	24' 0"	Not known	250	Do.
3"	71' 3"	*Nil.*	250	Successful.
6"	164' 0"	*Nil.*	250	Do.
6"	34' 0"	...	....	Bores taken for Bridge Foundations.
6"	26' 0"	...	....	Do. do.
6"	25' 0"	...	....	Do. do.
6"	40' 0"	...	....	Do. do.
6"	47' 0"	*Nil.*	*Nil.*	In progress.

Bores made=136

Bored=5,989'·2"

tapped=35,883.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

APPENDIX Q.

SUMMARY OF THE WORK DONE UNDER THE HORTICULTURIST TO GOVERNMENT, BOMBAY, POONA, FOR THE YEAR 1927-28.

Staff.—There is no change in the staff except that Mr. S. R. Gandhi, M.Ag., has been appointed Horticulturist in Sind, and Mr. V. H. Kulkarni has been appointed demonstrator in Horticulture.

Financial Condition.—The financial situation of this section has not improved in any way. There is in fact further reduction in our budget. Our research and propaganda work is very much handicapped. Our present day activities demand a well equipped laboratory, more assistance on staff, and adequate Travelling grants, to discharge our duties properly.

Publication work.—During the year under report the following publications have been issued.

(1) Bulletin No. 148. Culture of Guava and its improvement by selection in Western India.

(2) Bulletin No. 153. The Economic value of Fruit Farming in Western India.

(3) Bulletin on the Die-back disease of citrus trees and its relation to soil conditions in Western India.

(4) Bulletin No. 95. The cultivation of oranges and allied fruits. Revised.

(5) Improvement of Pandhari Sahebi grape by the use of seedlings. The Agricultural Journal of India, Part II, Vol. XXIII, March 1928.

(6) The value of Zizyphus rotundifolia as a stock.

(7) Leaflet No. 23. Economic method of controlling the pomegranate caterpillar.

(8) Leaflet No. 20. Drainage in Orange and Mosambi plantation on the Deccan Canals.

(9) Leaflet No. 24. The budding of wild Bor trees in Gujarat.

(10) Leaflet No. 26. Improvement of lemon crop by budding.

(11) Leaflet No. 4. Home Canning of fruits.

(12) Leaflet No. 4 of 1918. The treatment of wounds and cavities of trees. Revised.

(13) Leaflet No. 14. The treatment of mango plantation. Revised.

Besides, a great deal of publication work is in hand. It is hoped that the sincere co-operation of the members of my section as well as interested public will enable us to turn out a record number of publication in the ensuing year.

It may also be mentioned here that Mr. S. S. Bhat has successfully competed for his M.Ag. degree of the University of Bombay.

Teaching Work.

Our teaching work, as mentioned in last year's report has greatly increased. The number of advanced Horticultural students during the year under report was 14 as against 9 of the last year. The Professor of Horticulture has always to seek the assistance of other members of the section in order to carry out teaching programme. It is therefore essential to point out that a whole time assistant Professor of Horticulture is now required to cope with this work which demands about twenty-two hours per week for actual teaching and a great deal more time for the preparation of lessons.

Laboratory Work.

Besides fruit juices among which lemon juice stands prominent, our work deals with the preservation of bor and the preparation of Jellies. It is observed that fruits such as figs, Guava, Karwand and Jambhul, afford a good material for jellies.

All this work in connection with preservation will materially help to prevent wastage of fruit as well as glut on the market. I cannot but again emphasize the necessity of a well equipped laboratory, without which our research work has been very much handicapped.

Salting of fruits and vegetables is another line that presents a good scope for investigation. Sliced mangoes and cucurbits can be packed in 10 p.c. Salt-water in barrels for export purpose. All the details of these preserves are being worked out and will be presented for publication soon.

Ganeshkhind Botanical Gardens.

Citrus Stocks.—The Santra grafts on the Kavat have borne fruits. The fruits are quite normal in the development. This stock presents a great future.

The value of Bel plants as stocks is also being worked out. Bel plants have been grafted with Citrus varieties.

The Die-back of Citrus trees.—All this work that has been done up-to-date has been submitted in the form of a Bulletin. Our future investigations mostly deal with remedies. We are trying to find out if use of some stock or some cultural treatment is essential to get over this difficulty.

Root pruning and Root exposure.—Different methods of exposing and pruning the roots of Citrus trees are in progress in a Santra plantation in Ganeshkhind Botanical Gardens. Their comparative merits will be known in a short time.

Manuring of Santra trees.—Artificial as well as organic fertilizers are applied to Santra trees in the orchard to determine the best manures and the best doses suited to our conditions.

Both these treatments have a bearing not only on the production of Santra trees but also on the remedies against the Die-back disease.

Banana seedlings.—Most of the seedlings have borne fruits. The fruits are very desirable and in several instances differ from the parent stock (or plant). The suckers are being multiplied and their resistance to cultural conditions is under trial.

Mochunba orange has borne fruits. The quality of the fruit is quite satisfactory. The growth of the scion also is good.

Guava.—All the work on this crop has been presented in Bulletin No. 148. Our selected numbers are superior to local guava. The present work deals with hybridization of Psidium Cattleyanum. Our object is to get a guava with *red skin* and few seeds. It is difficult to foretell the results. A special graduate assistant has been put on this work. The study of the pollen grains of different varieties has already been made.

Fig variety trials.—About twenty-three different varieties of Adriatic fig have been planted for trials. The D 'or and the Dattato have borne a few fruits. The quality of the fruits is superior to our local figs as regards sugar contents and other texture.

Eucalyptus variety tests.—It is observed that out of thirty varieties four varieties have shown a satisfactory growth, namely (1) E. Albens; (2) E. Meliodora; (3) E. Rostrata; (4) E. Siderophloia.

Mango Stocks.—A big plantation of Alphonso and Pairi has been laid out from stone with a view to determine if they breed true to the parent plant. The irrigation requirements for such plantations are also being worked out. The growth of mango stocks is proportional to the depth of soil. The growth of scion is observed to be proportional to the diameter of the stock.

Top-working of Mango.—To test the economic value of these investigation a big area with about one thousand mango trees have been placed at our disposal by the forest department. These plants are being treated for top-working. This demonstration if successful will open a new era in the development of Mango Industry in the Presidency.

Ornamental.—Several new types of Begonias have been developed as a result of seedling raising.

Foreign plants.—Through the courtesy of Captain Flanders, Superintendent of Markets, Bombay, we received a collection of passiflora edulis, and monmouth, horse raddish, logan berry and subterranean clover and a variety of Loquet. It is rather early to offer any remarks on this subject.

Modibag.

Citrus Stock.—It has been observed that so far as the growth and ability of the stock to take bud, are concerned, the so-called " Kharna " and " Galgal " are better than Jamburi. In fact all our plants are bearing now, except Chinese orange on pomelo. Definite results will be soon achieved and published.

Improvement of Grapes by Breeding and Selections.

Pandhari Sahebi Seedlings.—Nos. 7, 21, 94, are decidedly superior to Pandhari Sahebi. An article on this subject has been published in the Agricultural Journal of India. Further tests dealing with the yield, disease resistance, and the quality are in hand.

Grape variety trials.—Several Basra grapes such as Ajmi and Deshalans have also borne fruits. The quality of these grapes is really good. It remains to be seen if their yield is satisfactory.

Root exposure.—The effect of salts and other conditions on the healing of cut ends is under test. The results are not available at present. Looking to the importance of this work a special graduate assistant has been put on this work. It means an important activity along with citrus-dieback-work.

Banana cultivation.—The different methods of cultivation in various parts of the Presidency have been studied. The comparative value of different varieties have been worked out. These results will be published in a bulletin very soon.

The Economic value of fruit cultivation.—The figures of the cost of cultivation and income in several crops have been worked out. Banana and Papaya rank the highest as regards marginal profit. The results are published in Bulletin No. 153

The Irrigation Requirements of Fruit Crops.

Water requirements of Santra, grape, and bananas in hot weather are determined. Economy in quantity of water may be obtained by different systems of beds without least affecting the yield. However our trials as regards the quantity of water required to get a normal crop are in progress. It is difficult to say anything in this matter at this stage.

Exotic plants.—A further consignment of Spanish varieties figs has been received. A fairly big percentage of plants has arrived and will be planted along with other varieties in the Ganeshkhind Botanical Gardens.

Cabul Pomegranate plants raised by cuttings have borne fruits, which show the normal colour and the seeds are extremely soft. The fruits are of medium size.

Chinese bor.—The plants have borne fruit for the first time and it is observed that the fruit is less corky and has attractive colour. It dries well.

Advisory and District Work.

During the year under report we have handled enquiries mostly dealing with the cultivation of orchards and the supply of improved stocks and seeds. As regards cultivation, the growers have often been advised on the spot to follow the best methods. Improvements in their methods of cultivation have naturally resulted in the improvement of the quality of the fruit.

As regards the improved stock and seed, large number of foreign fig plants, suckers of the Queen Pine-Apple, Seedless guava plants, Navel orange buds, Bagdad grape vine cuttings and Bonny Best tomato seeds have been distributed. It may be mentioned here that during the current year, at least sixty per cent. sowings of tomato at Mahabaleshwar was made out of our seed. Six shows have been held. Eleven demonstrations have been organised. Two horticultural classes have been held, one at Satara and another at Pardi in the District of Surat. These classes were attended by about one hundred adults and school boys. I may here point out that a notable feature of our advisory work has been the popularity of Horticultural Classes and the Mango Show at Bombay. These activities have been hailed with public appreciation beyond expectation.

The Mango show at Bombay was attended by nearly sixteen thousand visitors. This show has enabled us to know that Salsette produces the best Alphonso mango and Alphonso in syrup is perhaps the best preserve. These results are likely to have a great bearing on the development of mango industry in the future.

Bor.—Our bor work in Gujarat has become very popular. We have mentioned the details of the operations in leaflet No. 24 and also in a research article in the Agricultural Journal of India. This work has now been extended in the Deccan, particularly to Poona and Satara Districts.

Co-operations with the Irrigations Department.—We have laid out fig variety trial plots at Haturne and planned out an orchard at Baramati to test the resistance of various fruit trees to salt contents. In both these undertakings we appreciate the attitude of the irrigation authorities, particularly when they have agreed to defray all the charges of maintaining these collections. A similar co-operation in other parts of the Presidency will be only too welcome.

Co-operation with nurserymen.—We have placed our services at the disposal of all nurserymen in the Presidency. All improved stock of plants is given free of cost for the first time at least for propagation purposes. Most of the nurserymen have taken advantage of this offer and consequently improved stock is finding access to the grower.

Co-operation with Municipal Authorities.—Several municipal authorities have agreed to lay out fruit orchards in their gardens. A scheme has been prepared to push our improvement work through this agency. These gardens will be used as nurseries and demonstration plots for the introduction of improved fruit stock.

Besides this, several municipal authorities have started looking into the market conditions and are co-operating with us in studying their system of marketing and in holding fruit shows. It is believed that every effort will be made to improve market conditions by which consumer will get a good quality of fruit at a reasonable price and also the grower will find a steady market for his produce. The details of these conditions are being further studied.

It is exclusively due to the results of our investigation, advisory and propaganda work as outlined above that the quality of the fruits in general have improved in the market. New fruits and preserves have been introduced and complaints as regards scarcity of fruits in several markets in the Presidency have been got over.

G. S. CHEEMA,
Horticulturist to Government.

APPENDIX R

Summary of work done under the Inspector of Agricultural Schools, Bombay Presidency, Poona, during the year 1927-28

The permanent incumbent Mr. K. M. Pawar having been transferred to act as Deputy Director of Agriculture, N. C. D. Nasik, I held charge of the post during the year under report. The District staff and the Head Masters of Vernacular Agricultural schools were made available to conduct the Annual Examination of the Agricultural Schools and Agricultural Bias Classes including the Vernacular Final Examination with agricultural bias course. An itinerant Weaving Assistant was given during the year to train some of the staff members at the Vernacular Agricultural schools in order that weaving at these schools may be systematically taught to the boys

Nature of work.—The nature of my work has been, as in previous years, mainly advisory both in connection with the Vernacular Agricultural Schools and the Agricultural Bias Classes attached to the primary schools. Both these types of institutions were supervised and inspected. But owing to the increase in the number of Agricultural Bias Classes and their scattered nature throughout the Presidency, some being located 40 to 60 miles away from Railway Stations, a few of the Agricultural Bias Classes could not be visited.

Working of the Vernacular Agricultural Schools.—The number of these schools remained the same as in the previous year, *viz.*, six, one in each of the agricultural Divisions of the Presidency Proper except in Guzrath where there are two schools.

The number of students at the different schools.—The total number of applications for admission and the number of students admitted at each of the different schools from the dates of their commencement is as shown below :—

Name of Schools	Limit of admission	Period since which the school is at work	Number of applications			Number of Boys admitted and undergone the course	
			Total	Brahmins	Others	Total	Brahmins
	Boys	Years					
Loni	50	19	800	368 (46 P. C.)	432	471	189 (40 P. C.)
Devi-Hosur	30	15	589	236 (40 P. C.)	353	223	65 (29 P. C.)
Dhulia	30	6	324	38 (12 P. C.)	286	70	14 (20 P. C.)
Jambul	30	11	187	116 (63 P. C.)	71	168	102 (61 P. C.)
Godhra	30	8	408	30 (7½ P. C.)	378	122	12 (10 P. C.)
Surat	30	6	181	84 (47 P. C.)	97	89	44 (50 P. C).
Total ..						1,143	426 (38 P. C.)

Name of Schools	Number of Boys admitted and undergone the course—*contd.*							Remarks
	Marathas	Patidars	Lingayats	Raddis	Mahamedans	Criminal tribes	Others	
Loni	213 27	..	19	..	1	1	21	The number of Brahmin boys is comparatively more at Loni, Jambul and Surat schools than at others.
Devi-Hosur	2	..	117	20	2	1	16	
Dhulia	24	11	..	..	2	3	16	
Jambul	63	..	..	..	..	..	3	
Godhra	...	68	..	..	..	30	17	
Surat	..	31	..	..	..	1	13	
Total ..	329	105	136	20	5	36	86	

It will be seen from the above statement that the number of applications for admission is far in excess of what we can actually admit and that all different leading classes of boys are represented the tendency of Brahmin boys getting advantage of these classes being marked when compared to their usual profession. At Loni and Devi-Hosur schools, boys get monthly scholarships to cover part of their boarding expenses. This system was introduced at Devi-Hosur school in the year 1922 and at Loni school in 1925. This system has greatly helped in the reduction of actual boarding charges per boy per month by necessitating the boys to economise the expenditure in all possible ways. Formerly when this was a Government concern, there was no responsibility on the boys and the boarding manager too had the plea to offer that the boys demanded a particular type of food and that they were discontented if not agreed to. The scholarship system has removed this difficulty but seems to have indirectly helped the boarding manager to shift his whole responsibility on the boys which is not contemplated by this scheme and is to be guarded against by the Head Masters of schools where the scholarship system has been introduced. Unless the scholarship system is introduced in all schools taking care however to see that boys are made to pay just a small sum to show real earnestness for this type of education but not more than Rs. 2 or 3 per month, it does not seem possible to extend the scheme. In the case of boys from non-agricultural families desiring to have agricultural education, they should be treated differently from boys from the agricultural classes in respect of scholarship since it is very unlikely that the former take up to actual farming. Besides they are well-to-do and try to have this education not solely for earning livelihood from farming but only for the sake of fancy or for service, knowledge gained being not actually utilised on the farm in a majority of cases.

Curriculum.—During the year under report, *curriculum* practically remained the same. But change is necessary to make it more practical and precise in nature thus enabling the Head Masters to attempt only certain definite things of a practical nature more thoroughly than hitherto and thus make the course more appealing to the agriculturists for whom

it is intended. Else the number of boys from the agricultural families seeking admission into these schools is bound to go lower down as is the case at present. Workshop, weaving and poultry have been greatly developed since these appeal greatly to the agriculturists and a special Weaving Assistant has been appointed to enable the different schools to undertake teaching weaving systematically. Attempts are being made to change the cropping of the school land to suit the object of the course and to economise expenditure therein as far as possible.

Inspection and Examination.—The agricultural schools were periodically inspected and the teachers helped in their teaching work. All the schools have done fairly good work. At Jambul most of the boys and staff members suffered seriously from malaria and the school had to be closed for a time. There was again some change in the personnel of the staff members of that school which also affected the school work to some extent. The work at the Guzrath schools did not suffer to any appreciable extent on account of the flood distress in that part. The results of the Annual Examination of different schools are as given below :—

Name of schools	1st year		2nd Year		Teachers under training		Remarks
	Appeared	Passed	Appeared	Passed	Appeared	Passed	
Loni, ...	23	15+3	22	22	6	4	The number after the sign + denotes the number of boys promoted though failed.
Devi-Hosur	17	11+3	14	10	5	4	
Jambul	12	8	10	10	..	..	
Dhulia	17	13+3	13	10	..	..	
Surat	16	14+2	14	12	..	..	
Godhra	13	9	9	7	..	..	

The present method of practical examination at the end of the school year in April needs change, as it becomes more artificial than real, the conditions being then unfavourable for practical agriculture in particular. Periodical examinations during the different agricultural seasons and assigning some marks for students' work during the year as gauged by the Head Masters will be necessary to test the actual work and knowledge of boys in the different practicals properly.

Health of boys.—The health of boys was fairly good in all schools except at Jambul which is *malarial.* The petty illness that boys occasionally suffer from is mainly due to indigestion caused in a majority of cases by taking "Nyahari" (Breakfast) to which they are not usually accustomed. "Nyahari" is only necessary to those that work hard in the field and the usual time for this is generally at about 8 a.m. Our boys take "Nyahari" (Breakfast) at 6-30 a.m. not because they are in need of it, but because it is offered. I think "Nyahari" should be entirely done away with, the morning meals being arranged at about 10-30 a.m.

General.—These schools are training a number of boys every year for practical farm work. Some of these have taken to actual farming, while others have entered service either in the Agriculture Department or under the Taluka Development Associations. In a few cases, they have been engaged as teachers in primary schools especially where there are agricultural bias classes. In cases, in which the boys have had their farm tilled by their parents before they entered the agricultural school, they have gone back to their farm and have been of great use to their parents in the improvement of their estate and have brought about increase in the returns and net profits from the land and have also appreciably added to the income by undertaking petty repairs to implements themselves and by supplying their own clothing to a certain extent. In cases, however, where the work has been taken up afresh, there have been many failures chiefly owing to difficulties in respect of supply of the necessary capital. It is this latter type of boys that seek service; but wherever they have been engaged in service they have proved very useful and competent as practical workers. As this type of education is costly, it seems advisable to strictly restrict admission and scholarship to boys whose parents being economically sound to undertake farming have actually been tilling the land and have land sufficient at least for one pair of bullocks. In case, however, the Agriculture Department or the Taluka Development Associations or the Educational Department require boys with agricultural training at the agricultural schools for service as *Kamgars* or *Teachers* as these boys have proved very efficient workers for such institutions, certain number of these may be specially trained, provided, these institutions pay fully for their maintenance during the period of training.

Supervision of past students' work.—Some of the past students' fields in the Southern Division were visited and some assistance in their work was given. Some boys have done excellent work and the profits derived have appealed to other people. The work of the proposed Divisional Association of past students in S. D. could not be taken up by the students themselves without Departmental help necessary in the initial stage, as the help of the Department to allow some officers as ex-officio office-bearers of the association could not be obtained.

Weaving Assistant's work.—The itinerant Weaving Assistant, who was appointed from the latter part of August, commenced his work at Jambul school. But owing to serious spread of malaria, both the students and staff seriously fell ill and the teacher had to resign owing to unsuitability of the climate, having suffered a serious loss in the death of his wife. Owing to certain difficulties, new assistant could not soon be obtained. The work has been again continued there from June and a member of the staff has been trained and the Weaving Assistant will be shifted to Surat Agricultural School from August. The boys have taken to work very enthusiastically.

Agricultural Bias Classes.—These classes, it will be remembered, form part of some of the primary schools where agricultural bias course has been introduced, the object being to create and foster love for manual pursuits which are now being looked down and prepare the minds of rural

boys for agriculture which is the main industry of rural India, little attempting at definite vocational instruction and continuing all the subjects in the ordinary course with the exception of history and geometry, but correlating the subjects taught with rural life. There are 67 of these classes now at work in the Presidency, 8 in Sind and 59 in the Presidency proper distributed in the different divisions as shown below :—

Southern Division including North Kanara ..	16
Central Division including Khandesh District ..	21
Bombay Division including Nasik District	8
Guzrath Division	14
(Presidency proper) Total ..	59

Besides, there are 4 classes opened by different missions.

Working of the classes.—As far as working is concerned, they have made fairly good impression on the local cultivators. But where, these classes have been opened in unsuitable places, *e.g.*, places having the influence of Brahmins, traders, Government servants, or men of other professions, there has been some opposition in respect of these classes as these classes of people desire to have the ordinary course and English education for their boys. Except in Konkan, there is general demand for more of these classes from the cultivators especially so in parts of Karnatak and Khandesh. Guzrath also is really in favour of these classes, but the District Boards do not wish to bear their share of increased expenditure. The Educational Inspector, N. D., is trying to open these schools there, on self supporting lines by taking land on profit sharing system, the share of profit to the school being utilised for further expenses, initial expenses being met by the popular contribution. In this case, the agricultural teacher will be a past student of one of the Vernacular Agricultural schools in place of an ordinary assistant. This system is worth trying but the efficiency of class teaching is bound to suffer as there is no trained hand for it, the agricultural teacher in this case being only useful for practical teaching in school garden, weaving and workshop classes.

Supervision and Inspection.—As regards supervision, the Inspector's visit once a year at the most is quite inadequate and a local officer for each Division intimately acquainted with the work is necessary to give timely aid to these teachers by frequently visiting these classes and to conduct them on fairly uniform lines as has been arranged in the case of N. D., where an Assistant Deputy Educational Inspector has been placed in charge of all the agricultural bias classes in the Division. This is necessary to co-ordinate the efforts of the different District Boards which, though earnest to develop this work, cannot do it themselves as the work is of a semi-technical nature. Besides there are many difficulties which require the help of Government and a special Government officer for each Division will be a link between the Boards and Government specially in respect of these classes.

Training of Teachers.—This was continued during the year, only at two of the agricultural schools, *viz*, Loni and Devi-Hosur. The teachers

sent almost invariably joined the class late. As the period of training is limited to only 10 months, it goes hard to finish the course properly if they come late. This should be checked by refusing admission to late comers, whosesoever's fault it may be. The present restricted number of teachers sent for training does not allow of rapid development of the movement nor will it give scope for rigid selection and removal of inefficient teachers. As owing to financial stringency the proposed rural training school cannot be soon materialised, the existing training schools may be taken advantage of in training the Vernacular Final boys with agricultural bias and additional agricultural training as at present may be arranged for them as this additional training will be necessary though the proposed rural training college is opened, as the main object of training colleges is to train the boys more in the *teaching methods* than to add to the knowledge of the boys in the different subjects.

R. Y. HULKOTI,
Inspector of Agricultural Schools,
Bombay Presidency, Poona.

APPENDIX S.

Summary of work of Agricultural Propaganda in North and Middle Sind under the Assistant Registrar of Co-operative Societies, Sind, for 1927-28.

I held charge of the office of agricultural propaganda Officer throughout the year in addition to my duties as Assistant Registrar of Co-operative Societies in Sind. The area of my activities remained the same as last year, *viz.*, the following, 11 talukas :—

North Sind :—

(1) Taluka Ghotki, (2) Taluka Sukkur, (3) Taluka Larkana, (4) Taluka Kambar, (5) Taluka Shikarpur, (6) Taluka Mirpur Mathelo.

Middle Sind :—

(1) Taluka Hyderabad, (2) Taluka Halla, (3) Taluka Tando Allahyar, (4) Taluka Shahdadpur, (5) Taluka Matli.

Propaganda Staff.

There were two Inspectors and five Overseers working under me as last year and they all continued to do good work.

Season.

The inundation season of 1927 commenced very late and water in the water courses began to flow hardly by the 10th or 15th of July instead of by the beginning of June as usual. It was thus late by about 1½ months with the result that the area under cotton cultivation was considerably reduced. The crops in the District of Larkana, Nawabshah, Nara Valley Division and western talukas of Sukkur District were fair on the whole, while in the Jamrao tract of Thar and Parkar and Lar tract of Hyderabad District, they suffered owing to heavy floods. There was unprecedented rainfall in these tracts which caused considerable loss to crops, grain and cattle. In northern part of Hyderabad and eastern talukas of Sukkur the crops suffered on account of general deficiency of water supply while in Karachi District great damage was caused to them by a serious crop pest called "Ruro." The season therefore was on the whole unfavourable for the Agriculturists.

Frost.

There were repeated attacks of severe frost on the Rabi crops from the 26th of January to the middle of February and again in the first week of March. Oilseeds and potatoes suffered to the extent of 50 per cent., Mattar 60 per cent. and wheats on an average of 25 to 30 per cent.

Plant and animal diseases.

Rust and grass-hopper attacked rice crops in Larkana and Kambar talukas while in Karachi District the rice crop was fatally affected by

Ruro. Sugarcane was damaged in Sukkur and Shikarpur talukas by the stem borer to the extent of 30 per cent. Gram was affected by adverse winds and catterpillar to the extent of 60 per cent. Locusts visited Shikarpur, Sukkur, Larkana talukas in October and Ghotki and Mirpur Mathelo in November and damaged the Kharif crops to some extent.

In middle Sind there was an attack of Bol worm and Mahalo in cotton crop but the damage done was not serious.

Fodder.

In the beginning of the inundation season fodder got scarce and the price of wheat chaff in Upper Sind went up to Re. 1 per maund and Kadbi Rs. 2 per maund. Even palal (paddy-straw) had got scarce. The situation was however somewhat eased with the development of inundation. In middle Sind there was nothing to complain about the shortage of fodder.

I. Popularization and distribution of seeds.

(*a*) *27 N. R. Cotton.*—Amongst the various types of cotton seeds the 27 N.R. variety has acquired all round popularity in the cotton growing tracts of middle Sind and the people are increasing its cultivation from day to day commensurate with the quantity of seed available. Owing to the greater percentage of lint that is derived from its Phuties, and superior quality of the cotton itself, it fetches premium of 0-8-0 to 0-12-0 per maund in the market. It besides ripens earlier than other varieties. Hence it is that the growers give it preference over all other local varieties. Most of them preserve their own seed out of the crop while others purchase it direct from the ginning factories at Hyderabad, Tando Adam and Nawabshah. During the year under report the conditions for the cultivation of cotton were not quite favourable owing to late rise of the river, etc., but inspite of that about 2,000 maunds of N.R. Seed were cultivated by the growers in the middle Sind and the area covered by this variety was about 8,000 acres.

(*b*) *Bhitshah Cotton.*—Next to N.R. is Bhitshah cotton and 2,150 maunds of it were distributed in the following four talukas of middle Sind :—

1.	Hyderabad	1,000	maunds.
2.	Matli	300	,,
3.	Tando Allahyar	700	,,
4.	Halla	150	,,
	Total ..	2,150	

Apart from that about 2,117 maunds were purchased during the year by the growers direct from the factories for the Kharif crop. Total Bhitshah seed cultivated during the year in Middle Sind was thus 4,267 maunds and the area under this variety was about 12,800 acres.

(*c*) *Pusa 12 wheat.*—Experience has shown that Pusa 12 wheat thrives very well in irrigated soils. Under Bosi conditions too it does well where there is abundance of sub soil moisture. It was first introduced in Sukkur Taluka in 1922 and soon after it it spread to Shikarpur and subsequently to Ghotki and Mirpur Mathelo talukas. Owing to its deliciousness, well developed seed, early ripening and rust resisting qualities it has found great favour with the people and they sow it out of their own free will and choice. In Sukkur Taluka about 50 per cent. of the total wheat area is grown under it, while in Ghotki and Mirpur Mathelo Talukas where wheat is grown very largely the area covered by Pusa 12 is about 60 per cent. of the entire area. In Shikarpur Taluka there are special facilities for the growth of Pusa 12 as the soil there is very good and there is a large number of wells there. There is now no village in Shikarpur Taluka which does not grow Pusa 12. In Larkana Taluka the scope for growing wheat is very limited as there being much "Kalar" in the soil it is suited better for rice crop generally. In suitable places however Pusa 12 has been introduced and the area covered by it up to now is about 500 acres. It is making considerable progress in the villages of Akil, Mahar, Mahota and Chuherpur where it is being multiplied also.

Pusa 12 in Middle Sind.

Owing to unprecedented floods in Middle Sind during the inundation season last year there arose considerable demand for wheat seed there and about 700 maunds of Pusa 12 were purchased from Upper Sind and distributed amongst the zamindars. The germination of the seed has been most satisfactory and very well appreciated on that account. In comparison with the Desi wheat, Pusa 12 thrived much better. While the former varieties suffered from rust to the extent of 4 to 6 annas in the rupee Pusa 12 was affected to about 6 pies only in the rupee. The intrinsic quantities of Pusa 12 enumerated above have made it popular in Middle Sind also.

One hundred and seven maunds of Phundni and Thori wheats were besides purchased from the wheat Farm, Jacobabad, and given to one Sardar Khan Ghoto of Ghotki Taluka. He appreciated these seeds very well and is trying them on his land for the sake of comparison and contrast with Pusa 12 wheat.

(*d*) *Multiplication of selected rice and Jwar strains.*—In my last year's report I had remarked that about 400 maunds of selected rice strains, *viz.*: prang, Jajai and Kangni had been given out to progressive zamindars of the Larkana Taluka and a few others also. Unfortunately the river last Kharif fell down earlier than usual with the result that the rice crops generally became sterile. A few of the zamindars who got fairly good crops were desirably impressed with it and have preserved the seed for further multiplication, *e.g.*, K. B. Shahnawazkhan Bhutto has preserved 145 maunds, and Haji Immam Bux Mahota 40 maunds. Some of the zamindars have given the seed to the grain sale society of Larkana for distribution amongst the zamindars for next Kharif and

Mr. Mahomed Ayub Khan Khuhro has given the largest quantity from amongst them.

The selected strains have roused great enthusiasm amongst the growers as they fetched better price in the market over other varieties. K. B. Shah Nawaz Khan Bhutto and the Manager, Grain Sale Society, Larkana, got a premium of 8 annas and 2 to 3 annas per maund on the Prang and Kangni varieties respectively.

The multiplied seeds of Prang, Jajai and Kangni varieties have been distributed by the Grain Sale Society amongst the zamindars and in addition thereto 307 maunds (shown below) secured from the Government Farm, Larkana, have also been distributed :—

Sugdasi	..	..	50 maunds.
Prang	..	..	57 ,,
Kangni	..	..	200 ,,

The results will be known after the crops are harvested.

The following varieties of selected Jwar strains obtained from the Larkana Farm were besides distributed in Sukkur and Shikarpur talukas under the seed multiplication scheme.

Savro Kartuho	..	..	189 lbs.
Achi Kodri	..	..	78 ,,

More seed was not available.

(*e*) *Trial of early Jwar Strains.*—In order to profitably utilize the supply of water from the months of March to June which will be available during that period after the Barrage scheme is put in force, the research station at Sakrand have evolved two varieties of Jwar, *viz.*, Achro, Bazigar and Achri Turi which can be sown and matured within three months, *viz.*, March to June. The Inspectors of North and Middle Sind respectively got the following quantities of these strains which were given out to the growers :—

		North Sind.	Middle Sind.
Achro Bazigar	.. ..	11 lbs.	17 lbs.
Achri Turi	.. ..	10 ,,	25 ,,

The crops have not yet been harvested but the results achieved so far are quite promising in some places.

(*f*) *Trial of Sugarcane varieties.*—In Sukkur Taluka where sugarcane cultivation is carried on on a very extensive scale, the striped mauritius variety chiefly used for Gul-making purposes has lost its ground owing to the large quantities of Local Lahori (generally used for chewing purposes) having become available for Gul-making purposes being unfit for chewing owing to stem borer attack. The area under striped mauritius sugarcane has therefore been reduced considerably and during the year it was cultivated to the extent of about 50 jirebs (25 acres) only. Five maunds and 10 seers of Coimbatore sugarcane No. 213 successfully grown on the Agricultural research Station at Sakrand were therefore ordered in Rabi last and introduced as an experimental measure at Khahi, the best sugarcane growing centre in Sukkur Taluka. The

seedlings were distributed free and sown by the following zamindars side by side with the local Lahori cane :—

(1) Seth Ladhomal.

(2) Seth Gokalmal.

(3) Seth Jurbomal.

So far the crop has come up satisfactorily and its outlook is comparatively better than that of the local variety.

(*g*) *Berseem seed.*—Berseem seed is most nutritious and healthy fodder for cattle and other livestock and as such its demand is increasing day by day in middle Sind. During the year only 12 mds. 24½ seers could be supplied by the Deputy Director though there was demand for at least double the quantity. An indent for 27½ maunds has therefore been made for the next year.

II. Popularization of implements.

Under the supervision of the Agricultural Overseers, the Kamgars of the Associations' moved about from village to village carrying on demonstrations of implements and side by side showing to the zamindars the advantages of the dry ploughing system. Demonstrations of implements are carried on on the fields of the zamindars partly on rent and partly gratis. This gives the haris an opportunity of having a personal experience of the proper utility of the implements and the superiority of the methods of cultivation advocated to them.

The Kamgars of the various associations visited 202 villages in North Sind and 237 villages in middle Sind, *i.e.*, 440 villages in all. In addition to the area ploughed gratis purely for demonstration purposes the total area ploughed on rent aggregated 935 jirebs yielding a rent of Rs. 909-8-0 which was duly credited towards the associations concerned or to the Government Treasury.

As a result of the above demonstrations the following implements were sold during the year by the various Taluka Development Associations in addition to those purchased by the people direct from the local mistris whereof no record can be kept :—

	No. sold in Middle Sind	No. sold in North Sind	Total
Sirkar plough	167	112	279
Chatanooga plough	11	3	14
Meston plough	19	....	19
Poona ,, ...	....	1	1
Monsoon ,, ...	1	....	1
Rajah ,, ...	....	1	1
Cambridge roller	1	....	1
Sugarcane mills	....	2	2
Bullock Screws	....	7	7
Hand Screws	1	107	108
Scrapers	....	3	3
Ridging Boards	....	1	1

The degree of popularity acquired by each of the above implements has already been discussed in detail in my previous reports.

Just after the close of the year Motor Tractor demonstrations (with Cletrac Tractor) had been organized at 8 centres in North Sind. The demonstrations were very largely attended and greatly appreciated. The Tractor on an average was found to plough an acre in three hours. Demonstrations lasted for nearly a month during which time 41 acres were in all ploughed up. The zamindars have appreciated the machine very much and leading zamindars like Mr. Mahomed Ayub Khan Khuhro, and Amir Bux Khan Mahar and Haji Immam Bux Mahota have thought of going in for it at once, the first two independently while the third in Co-partnership with others. There is also a move amongst the zamindars to form Co-operative Implement Societies through whose agency they could have the use of the machine on hire, its initial cost being borne by the society whose funds are raised by share capital and loans from the Bank. The Tractor will without doubt become very popular in the near future specially after the Barrage when there is expected to be a great shortage of labour.

Sugarcane mills.—In Sukkur Taluka the Iron Sugarcane mills (Hathi type) have become very popular and have greatly replaced the local cane crushers. Moreover the cost of crushing of cane by means of the mill is 74 per cent. less than by ordinary mills and its outturn is thrice as much. Two new mills were sent for during the year from Calcutta for Seth Pribhdas which have given him entire satisfaction.

A fresh type of three roller sugarcane crushing mill Marstons No. 240 is offered by the Firm for demonstration at their own expense. Arrangements have been made with the firm to give delivery of the mill early in September next at Bagerji station. The mill will be tested in comparison with the Hathi type and results reported later on.

III. Popularization of improved methods of Farming.

(*a*) *Dry ploughing system.*—The system of ploughing up the land after harvest has now been very well popularized and is largely adopted both in the North, and Middle Sind tracts of the propaganda area. The Inspector of Agriculture, North Sind, carried out a detailed survey in the Larkana Taluka with a view to find out how much of the cultivated area was now being dry ploughed and from exhaustive enquiries he found that about 81·25 per cent. of the total area under rice was being thus dealt with. In Sukkur, Shikarpur, Garhi Yasin and Mirpur Mathelo talukas this system was quite unknown before but there also it is being introduced and adopted with great advantage in wheat lands. In middle Sind about 65 to 75 per cent. of the total cultivated area is being dry ploughed. This shows how well the system is being appreciated by the people.

Improved methods of rice cultivation.—Much has already been said about the advantages of reduced seed rate and early transplantation of rice. In Larkana and Kambar talukas one maund per acre is the usual rate while that recommended under ordinary conditions is half a maund per acre. The Agriculturists are however informed that this is applicable only when the conditions of the season, land and water are normal. During the last three years it has been observed that though the canals are fed by the 1st of June, water in them does not assume a satisfactory level till about the beginning or even the middle of July. Under such conditions the zamindars have been advised not to grow the rice seedlings even on well water before the 1st of June. Inspite of the caprices of the river, it is interesting to note that both the experiments [earlier transplantations of seedling and (2) reduced seed rate] repeatedly conducted by the Larkana and Kambar Taluka Development Associations on the fields of Zamindars and on the plot of land secured at Kambar have met with considerable success. So much so that not only are the existing wells being utilized fully for early growing of seedlings but new ones are also being sunk for the purpose.

During the year under report an experimental plot was secured on rent between Kambar and Alikhan for the convenience of inspection by visitors. In Kharif last one acre of this plot was divided equally into two parts and in one of them the ordinary seed rate of rice was used while in the other half the usual seed. Just before the harvest the President of the Taluka Development Association and several of its members visited the plot and opined that the reduced seed rate plot appeared comparatively better. After the harvest the reduced seed rate plot yielded 15½ maunds while the other sown with the ordinary rate yielded 15 maunds, *i.e.*, 31 and 30 maunds respectively per acre. Apart from this demonstration plot the results of reduced seed rate experiments on zamindari fields have been equally convincing and the zamindars therefore are betaking to the practice very largely. In talukas Larkana and Kambar over 1¼ lacs of acres are annually cultivated under rice and the saving effected by adopting the reduced seed rate method would amount to lacs when carried out in the entire area.

IV. Taluka Development Associations.

The number of Taluka Development Associations in my charge remained the same as last year, *i.e.*, one in each of the 11 talukas of the propaganda area. The distribution of seeds and implements and the organization of village and central demonstrations is carried on through their agency. The Associations were during the year inspected by the following distinguished visitors :—

(1) Mr. R. B. Ewbank, Collector of Sukkur, attended a demonstration organized by the Sukkur association at Bagerji on 21st July 1927. He appreciated the superiority of the Sirkar and the Chatanooga ploughs and was much impressed with the work of the Hand Archmedian Screw.

(2) Dr. Mann attended the demonstration at Ghotki on the 12th September 1927 and was greatly impressed by it. He eulogized the work of the Association in very empathetic terms.

(3) Mr. T. F. Main inspected the Taluka Development Association of Larkana on 17th November last and appeared satisfied with its work.

(4) Mr. V. S. Bhide, Registrar, Co-operative Societies, Bombay Presidency, Poona, visited 8 out of the 11 associations of my charge and expressed great satisfaction at the progress made by them. The Associations of Kambar, Tando Allahyar, Rashid Wagan (Larkana) and Matli had at the time of his visit in February last organized grand demonstrations of seeds and implements. Each one of the demonstrations was attended by over a thousand of people. Rewards in the shape of Lungis and written testimonials were awarded to the best seed growers and bullock breeders. The Taluka Development Association of Shahdadpur also organized a central demonstration at the time of Collector's encampment there.

It is gratifying to note that the Taluka Development Associations are becoming popular from day to day and expanding the scope of their activities in all possible directions independently. The members have now well understood the ideals of these institutions and in addition to the popularization of seeds, implements, and methods of farming, suggested by the Agricultural Department, they are trying to make themselves useful in a variety of other ways also tending of course to the general betterment of the class of Agriculturists as a whole. A few instances of such activities may be quoted as under :—

(1) During the heavy floods of last year malaria of a very severe type broke out in the flood affected areas and the associations of Tando Allahyar and Hyderabad distributed about 20 lbs. of quinine free amongst the members.

(2) The Hyderabad Taluka Development Association has since the last year arranged to get the gauge reading cards of the river Indus from the Public Works Department and the daily readings are notified in the Association's notice Board for the information of the members.

The Taluka Development Association of Tando Allahyar sent a deputation to the Executive Engineer for clearance of Gahoro Bhinphar and Allah Khahi canals. That officer received the deputation most sympathetically and did his best to effect thorough clearance of the canals wherever necessary.

The association (Tando Allahyar) has gone a step further also and with a view to give its members the benefit of joint sale of their produce, it has opened a central godown at Tando Allahyar wherein the produce from the smaller centres of the mofussil is brought down for sale. Negotiations are then effected with the factory owners regarding the wholesale rates of phuties (seed cotton) and experience of the last two years has shown that the agriculturists are getting a premium of 8 to 12 annas and at times even 14 annas per maund leaving aside the question that the

Sowkars themselves now come over to association's godown to make purchases rather than the people going over to their factories and wandering after them to accept their goods. The ground has thus been prepared for the development of a Co-operative Sale Society at Tando Allahyar and steps have been taken to extend the scope of the existing Tando Allahyar supply society so as to bring the sale business under the sphere of its activities.

It may further be observed about the Taluka Development Associations that they have been greatly instrumental in effecting recoveries from the members of their constituent societies. Their Supervisors visit the societies constantly and render much help in clearing the arrears. During the harvest season the associations temporarily engaged one or more extra supervisors also to cope up with the heavy work of recoveries.

The variety of phases in which the Taluka Development Associations have rendered themselves useful have made them very popular institutions and time is now in sight when they will be the only machinery through whose agency the agriculturists could make themselves heard and through which they could have their grievances redressed and their condition ameliorated.

APPENDIX T.

Summary of the work done by the Professor of Agricultural Economics during the year 1927-28.

This was the third year of this new section of the Department. I continued as Professor of Agricultural Economics throughout the year except from 6th April 1928 to 31st May 1928 when I was on leave. During my absence Professor B. S. Patel officiated in my place till 10th May 1928 and Professor V. G. Gokhale for the remaining period of my leave.

Mr. T. G. Shirname, B.Ag., continued to be demonstrator in Agricultural Economics and Mr. T. B. Pawar, B.Ag., Graduate Assistant, continued to be under me for district work.

The work of my section chiefly consists of (1) teaching and (2) collecting information bearing on Agricultural Economics and marketing of farm crops and the investigations bearing on the business side of Agriculture.

(1) *Teaching.*—Agricultural Economics is taught in junior B. Ag., senior B. Ag. and also to students in senior B. Ag., who take Agricultural Economics as their optional subject. There were 50 students in junior B. Ag., 72 in senior B. Ag. and 7 in the optional group of Agricultural Economics. Since Agricultural Economics goes in the group "Agriculture" the result of Agricultural Economics for compulsory course cannot be given separately. Out of the 7, taking Agricultural Economics as their optional, six appeared for examination. All the six passed in that subject. (Out of these six, three passed in all subjects and got their degrees, two got exemption in Agricultural Economics having secured more than 50 per cent. of marks and one got passing marks.)

During the year under report I got the special Agricultural Economics students to do some first hand investigation. A village about 10 miles away from Poona was selected for this enquiry and each student was asked to collect material on separate points and to write a paper. Full instructions as regards the collection of data and its arrangement and interpretation were given in the class and in the course of enquiries. The papers so prepared were submitted along with other papers for examination.

Each of the special students was also required to study marketing of an important crop of the tract from which he came. It is expected that such initiation in original research will prepare graduates better.

I also gave about 10 lectures on co-operative marketing to the Supervisors' class held under the auspices of the Central Co-operative Institute, Bombay.

(2) Collecting information bearing on Agricultural Economics marketing of farm produce and other investigations bearing on the business side of Agriculture.

This work was conducted through the following different agencies :—(*a*) by personal work, (*b*) work done through the one Graduate

Assistant attached to my office, (*c*) work done through the Graduate Assistants belonging to the Deputy Directors of Agriculture, N.C.D. and S.C.D. in addition to their usual work, (*d*) work done through the five agricultural Bias school teachers of N.C.D. and S.C.D.

(*a*) I have been trying to collect material on the marketing of Gul, cotton, groundnut, jowar, rice, citrus fruits, etc., for class work to make the subject more applied and practical. The recent report of the Royal Commission on Agriculture lays special emphasis on exhaustive enquiry into the marketing of important farm produce. For want of staff I have not been able to take up such investigation in the past. Two years ago the Director of Agriculture had at my instance budgetted a sum for enquiry into groundnut marketing. Administrative sanction for such expenditure could not be got and this work could not be commenced.

(*b*) *Work done through the Graduate Assistant.*—The Graduate Assistant attached to my office continued to do the work of collecting data on costs of production of staple crops near Poona (at Nanded, Sathyache Pimple, Wagholi, Loni Kalbhor and Shahajpurwadi). He obtained his figures by paying weekly visits to these places except the last place where weekly visits were not found necessary as one of the local cultivators had agreed to keep the necessary record. The data on costs of production collected during the years 1925-26 and 1926-27 is worked out and published in the form of a bulletin (Bulletin No. 149 of 1927 of the Department of Agriculture, B.P.).

Figures for 1927-28 are being worked out and will soon be submitted in a bulletin form.

It is now three years since the work of finding out costs of production of crops in the Poona district was started. We have now got some definite idea about the costs of production of crops incurred by the cultivators. There is found a great deal of variation in the costs of production of each of the crops studied. Even in the same village yields vary considerably. The causes of variations will be explained in the bulletin that is in hand. The cost of production of particular crops do not supply data for the whole business of a farmer and with a view to secure data on costs as also on farm business I have, with the approval of the Director of Agriculture, selected 4 farmers at Nanded and Wadgaon and we are studying the entire business of these farmers. I believe such studies are of utmost importance and they will give some idea as regards the cost of production of crops as also of the economic position of the peasant farmers.

(*c*) *Work done through the Graduate Assistants from N.C.D. and S.C.D.*—The work on unit study started at Mumrabad (near Jalgaon) and Belapur (District Ahmednagar) could not be continued on account of the transfers of the graduates to whom the work was entrusted. The Crop Research Committee has now finally decided that graduate assistants under the Deputy Directors of Agriculture should not at present be given such additional work and so the idea of utilizing the services of district staff is dropped.

(*d*) *Work done through the five Agricultural Bias school teachers of N.C.D. and S.C.D.*—With a view to find if cultivators' time is fully utilized two agricultural teachers in the Bias schools at Jeur and Asoda were desired to keep daily diary as to how each of the members in the family spent his time.

The teacher from Asoda (Khandesh) had selected a farmer who owned 16 acres and 35 gunthas of land with a well and had two bullocks. There were two members in the family, *i.e.*, the farmer and his wife. He had engaged two permanent servants, one of whom got work for 346 days during the course of the year (1927-28) and the other for 288 days only. The wife of the owner did not work. The farmer himself put in 337 days' work on the farm. His work however chiefly consisted of supervision and of marketing of garden produce. Besides one temporary cow-boy was engaged for 66 days. The pair of bullocks got work for 282 days of the year.

Another farmer from Juer (Ahmednagar) having 8 acres and 13 gunthas of land with a well and two bullocks was selected. His family consisted of 3 adults (1 man, 2 women), two children and one boy servant. The farmer worked for 238 days in the fields, one woman for 198 days and the other for 174 days only. The boy servant put in 265½ days' work, while two pairs of bullocks worked for 285½ days only.

It may be said therefore that farmers with ordinary size of holdings having a well get work for a longer part of the year. It is however true that such farmers could have put in more labour or could have dispensed with part of the hired labour. We have no data about farmers having no wells though such farmers form large majority. From this year we propose to take one farmer with a well and another without a well at two places

The remaining three teachers were sending returns on the costs of production of important local staple crops. Figures for 1926-27 and 1927-28 are being worked out and will soon be submitted in a bulletin form.

Publications.

During the year under report the following publications were issued :—

1. Bulletin No. 139 of 1927—Sugarcane mills and small power crushers in the Bombay Presidency.
2. Bulletin No. 144 of 1927—Furnaces for making Gul or Crude Sugar in the Bombay Presidency.
3. Bulletin No. 147 of 1927—The organization and cost of Gul-making in the Deccan sugarcane tracts.
4. Bulletin No. 149 of 1927—Studies in the costs of production of crops in the Deccan, crops in the neighbourhood of Poona, 1925-26 and 1926-27.

Besides, the following three research bulletins are under preparation and will be soon submitted for publication :—

1. Studies in the cost of production of sugarcane by partnerships in the Warna Valley in the Satara-Kolhapur tract.
2. Studies in the cost of production of crops in the Deccan, crops round about Poona, 1927-28.
3. Studies in the cost of production of crops in the Deccan-Mohol, Narayengaon and Ozar, 1926-27 and 1927-28.

P. C. PATIL,
Professor of Agricultural Economics.

Poona, 1st August 1928.

APPENDIX U.

Summary of the work done under Officer-in-charge Agricultural Research Station, Sakrand, for the year 1927-28.

The problems dealt with in the Chemical Section are those mainly relating to soil, kalar and water—their movement and distribution in the soil.

Soils.—The soil at the Agricultural Research Station, Sakrand, consists of deep alluvial deposits. Several bore-holes, taken up to a depth of 30 to 50 feet, and in one case 144 feet show that no hard rocks are traceable up to these depths. These layers of alluvial deposists often differ widely in their physical composition but mechanical analyses done in this laboratory show that the soils at this Station may be classified as clay loam or clay. At different depths, however, sand and stiff clay are often found in alternate layers of varying thickness. Water is generally struck at a depth of 30 to 40 feet and almost invariably in a layer of sand.

Over 2,000 samples of soils have been analysed for their moisture contents and a large number of them for their salt contents during the year under report. The analyses show that a certain portion of the Farm contains as much as 1 to 2 per cent. of soluble salts and some even up to 4 to 6 per cent. soluble salts. In one of the layers at a depth of about 4 feet the salt contents were found to be as much as 11·8 per cent. with 5·2 per cent. Sodium Sulphate and 4·00 Sodium Chloride.

Chemical analyses* of the soil show that they contain 4 to 7 per cent. of lime, 0·04 to 0·06 per cent. of Nitrogen, 0·3 to 0·6 per cent. of Potash and about 0·2 per cent. of Phosphoric Acid. These analyses show that the soil contains sufficient quantity of lime but taking into consideration the virgin nature of the soil these soil layers cannot be called very rich in their ingredients of fertility especially in their Nitrogen contents.

Kalar.—A fairly large proportion of land at Sakrand is kalar or impregnated with salts. A detailed soil survey of the Farm area which is just being taken in hand will show the exact proportion of kalar land but at a rough estimate 30 per cent. of the land at this Station is bad kalar. The outward appearance of the land, which is a virgin land just taken out of jungle, is often very deceptive and unless an actual analysis of the soil is done or unless the area is brought under irrigation it is difficult to judge if the land is really good.

Analyses of a number of samples of kalar done in this laboratory show that the kalar consists chiefly of Sodium Chloride and Sodium Sulphate; Chlorides and Sulphates of Calcium and Magnesium are often present but there is, in general, absence of Sodium Carbonate which is a great relieving feature of the kalar lands.

The quantity of kalar that can be tolerated by a number of crops in Sind seems to be pretty high. Kharif crops like cotton, *Jowar* and *Guvar* can grow fairly well in a soil containing as much as 0·5 per cent. of total

*Kindly carried out by the Agricultural Chemist, Poona.

soluble salts consisting mostly of Sodium Chloride and Sodium Sulphate. Of the rabi crops *Jambo* stands kalar much better than other crops like wheat but Lathyrus Sativus, locally called *Matar*, seems to be more sensitive to kalar.

Reclamation experiments.—In the absence of Sodium Carbonate in the *kalar* it has been found, as stated above, that with an assured supply of water a land which does not contain more than 0·5 per cent. of soluble salts can grow a fairly normal crop. Some portion of the Sakrand Farm contained as much as 1 to 5 per cent. of soluble salts and was not quite fit for ordinary cultivation. Reclamation experiments were therefore undertaken in two directions.

(*a*) To drive the salts down into the soil by flooding the soil with a large quantity of water.

(*b*) By adding Calcium Chloride to the soil.

(*a*) *Flooding experiments* (*for kharif crops*).—A number of plots each measuring 2½ gunthas in area were laid out and levelled carefully. Four of these plots were taken for kharif experiments and water at the rate of 16 inches per acre was given from measuring tank in four doses. As soon as the first dose of water had soaked into the soil the second was given and so on till all the four doses of 4" each had soaked into the ground. A further dose of 2" of water was then given after a few days preliminary to sowing, and, as soon as the soil came into condition the land was ploughed and seed sown. The quantity of irrigation water given was different to different crops. The calculated yield per acre obtained was 900 to 1,500 lbs. of seed cotton, about 3,000 lbs. of *Jowar* grain and about 1,200 to 1,500 lbs. of *Guvar* seed.

It would appear that if the soils are fairly permeable, *i.e.*, if the water applied soaks into the soil without much difficulty a large proportion of the original salt-contents can be driven down into the soil and if the remaining quantity of salts is below 0·5 per cent. of the mixture of the Sodium Salts (excepting Sodium Carbonate), a good crop of cotton, *Jowar* and *Guvar* can be grown on the land in the first season of reclamation. The total quantity of water (or the delta Δ) in plot No. 8 where 27 W. N. cotton grew best amounted to 46" including water given for flooding and rainfall.

The quantity of water was given from 28th May to 18th October or during 143 days (value of n=143 days). This works out as 75 duty at the field for salt lands which contain from 1·0 to 1·5 per cent. of soluble salt and are fairly permeable. The duty as proposed by Messrs. Baker and Lane is 100 for sweet land at the outlet. Results obtained only for a season or two must, however, be taken with caution.

Flooding experiments (*for Rabi crops*).—Having ascertained in the kharif season that 16 inches water per acre given in four doses immediately before sowing kharif crops gave good results it was thought necessary to try the same quantity of water on land containing higher percentage of salts, and put under rabi crops. Eight plots each measuring 2½ gunthas in area and differing in their salt contents from 1·3 per cent. to 3·8 per cent.

were carefully levelled and 16 inches per acre of water given in four doses. After the soil came into condition the surface was stirred and plots left in this condition for three weeks before rabi crops were sown. Salt contents were again determined before sowing rabi crops. It was found that the quantity of salt was reduced to nearly half the original amount ranging from 0·7 per cent. to 1·7 per cent. yet it was comparatively high. Rabi crops, *viz.*, wheat, *Jambo* (Eruca Sativa) and *Matar* (Lathyrus Sativus) were sown in these plots.

Jambo did well in all the plots and the calculated yield per acre was from 1,000 to 1,500 lbs. of dry *Jambo* seed.

Wheat (Pusa 12) did fairly well but was patchy and the grain did not fill in quite so well. The calculated yield per acre varied on an average from 600 to 1,200 lbs.

Matar on the whole failed to germinate ; it seems to be more sensitive to kalar.

(*b*) *Reclamation experiments with Calcium Chloride.*—Three plots each measuring 5 gunthas in area were assigned to the kalar reclamation experiments with Calcium Chloride. These plots contained from 1·4 to 2·7 per cent. soluble salts. Each plot was sub-divided into two sub-plots one of which was treated with Calcium Chloride and the other was left for comparison without treatment. The quantities of Calcium Chloride added were at the rate of 1 ton, ½ ton, and ¼ ton per acre to each of the plots under treatment.

Except for the different quantities of Calcium Chloride all the plots received the same kind of treatment. Six inches of water were given before sowing, and cotton (27 W. N.) sown in all the plots. The germination percentage and the stand percentage in the treated plots were higher than in the untreated plots.

The calculated yield of seed cotton per acre ranged from 1,200 to 1,900 lbs.; it was comparatively higher in the treated portions of Plots No. I and III and was slightly lower in the treated portion of plot No. II as compared to the yield in the untreated portion.

It appears that the effect of Calcium Chloride on an alkali land is primarily to help the germination of seed and establish the seedlings in such land.

Water.—The main sources of water at the Agricultural Research Station, Sakrand, are (*a*) water from the lake, (*b*) water from a tube well.

Rainfall is uncertain and unreliable ; during the year under report, however, the total quantity of rainfall was 6·7″ most of which fell in heavy showers at the end of July 1927 and did immense good to the standing crops.

The water of Dhand taken in August 1927 showed on analyses that it contained only a trace of silt. The river water during this month generally contains the highest quantity of silt which was about 200 grains per gallon in the year 1927. Chemical analyses of the lake-water showed that it contained 17·20 parts per 100,000 of total soluble salts which shows that the lake water is excellent for irrigation purposes.

The tube well water is used when lake water is not available. The tube well had to be worked during 1927 from April to middle of July. Chemical analyses of the well water collected in May showed that it contained 43·6 parts per 100,000 including 4·69 parts of Sodium Chloride and 0·70 parts of Sodium Sulphate.

Soil moisture—In order to study the effect of different quantities of irrigation water on the land newly brought under cultivation at this Station, three plots each measuring 2½ gunthas were watered with different doses of water, *viz.*, 8", 6", and 4" from a measuring tank. Samples of soils were taken up to a depth of five feet at fixed intervals, *viz.*, 1 day, 2 days, 10 days, 30 days, and 120 days after irrigation. The following results were worth noting :—

(1) The highest quantity of water found in the soil one day after irrigation was 28 per cent. in the plot treated with 8 inches of water. The maximum water holding capacity of these soils varies from 50 to 60 per cent. so that under field condition the soil holds nearly half the quantity of its maximum water holding capacity.

(2) The penetration of moisture into the soil within 10 days after irrigation was found to be over 5 feet in the case of 8 inches and 6 inches of irrigation and 3·5 feet in the case of 4 inches of irrigation.

(3) On the uncropped land, stirred on the surface to form a soil mulch, the capillary force of water acted mainly up-to a depth of about 2 feet. Below that layer the moisture contents remained almost constant after a certain loss in the first 10 days.

Programme for the year 1928-29.—(1) Experiments are undertaken to determine the most suitable kharif duty on sweet land for cotton (4F), *Jowar* and *Bajri* the staple kharif crops of the tract. Similar experiments will be undertaken for the staple rabi crops, *viz.*, wheat.

(2) Experiments are being continued on reclamation of alkali land to which Calcium Chloride was added last year.

(3) Experiments are undertaken to determine the quantity of water necessary to leach out salts from soils containing a high percentage of injurious salts.

(4) Detailed Soil Survey of the Farm area with a view to find out the presence of salts, etc., is undertaken.

(5) Analytical work on the determination of the salts in soils and their distribution under irrigation water is in hand and will be continued throughout the year.

(6) Examination of soils from areas suitable for sugar-cane cultivation will be resumed.

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Annual Report of the Botanist, Agricultural Research Station, Sakrand, for the year 1927-28.

1. *Organisation.*—I held the charge of the office of the Botanist, Agricultural Research Station, Sakrand, throughout the year and also supervised the botanical work of the Sind Department proper. The entire botanical research in Sind both under the Lloyd development Scheme and the Sind Department proper was however officially placed under my control in the latter part of 1927. The botanical work in Sind is mainly directed towards the principal staple crops, *viz.* Rice, Wheat, Cotton and *Jowar* (Sarghum).

Research on Cotton.

2. *Future Cotton of Sind.*—Trial of Egyptian, American and *deshi* cottons have shown that the long stapled exotic cottons are capable of yielding nearly two-thirds of the outturn of *deshi* and acclimatized Punjab-American cottons. The reduction in outturn is due to low stand and not to decreased individual plant yield which on the contrary seems to be greater. Egyptian cotton is very much susceptible to white ant attack but the growth is luxuriant. It is likely that a strain of Egyptian cotton such as Ashmoni or Boss III or of imported American cotton such as Acala, possessing a staple of 1 1/16 inches, and a ginning percentage of 33 may become the future cotton of Sind under Barrage conditions. On the other hand the future cotton of Sind may have to be founded on Punjab-American cottons possessing a staple of 7/8″-1″ and a ginning percentage of 30-33 and that the staple may be improved by further selection and judicious hybridisation. Both lines of work are in hand.

3. *Study of agronomic factors in cotton.*—Hardiness to withstand local conditions of climate, soil and pests may well be judged by the percentage of stand obtained. It was found that in Egyptian cottons only 24 per cent. stand counted at the time of picking was obtained as against 58 per cent. in Punjab-American cottons and 75 per cent. in selected Sind *deshi* 27 W.N. Thick planting of seed was found to be very successful specially in the case of exotic cottons which show great mortality owing to white ant attack and other causes, with 9″ spacing between plants in the row, the plants showed more sympodial habit of growth, fruited early, had good bottom crop and gave an excellent yield. The optimum date of sowing was another agronomic factor under investigation. Sowings were made from 31st March to 1st June at various intervals. Sowings done in latter part of May were found to be the most successful. Data recorded on the incidence of disease showed that white ants are the most serious pest especially in virgin soil and in manured land. Egyptian cottons were found to be the most susceptible in this respect, the American cottons standing next and *deshi* 27 W.N. being the least susceptible. Red leaf blight was noticed in newly imported American cottons at late stage of the crop.

4. *Breeding of long stapled cotton by selection and acclimatization.*—A number of prominent varieties of Egyptian cottons, newly imported American cottons and Punjab-American cottons were tried during the year under report. A number of single plants were selected on the basis of hardiness, habit of growth, prolificness combined with good staple and high ginning in the more promising varieties particularly Ashmoni C/25, Boss III, Acala, 4F and 285F. These have been grown in the current season 1928-29 in line cultures.

5. *Breeding of long stapled cotton by hybridisation.*—Crosses of 285F Punjab-American cotton with Sea Island and Pima (Egyptian) have shown great tendency towards abnormal growth and sterility in the F2 and F3 generations. Even in the F4 generation raised during the current season there is no sign of homozygosity in any of the segregates. Consequently crosses were made between 4F cotton and Meade (both American cottons) during the year under report to combine the hardiness, prolificness, and high ginning of 4F cotton with the staple of Meade parent. F1 generation has been grown during the current season.

6. *Study of hereditary characters.*—A number of characters are under study in the pure line strains and new selections. The mode of inheritance of some of these will also be studied in the crosses recently made.

7. *Maintenance of purity of selected strains already in hand.*—The programme of maintenance consists of five stages. These are—1. Single plants or Progeny rows. 2. Selfing patch. 3. Breeding patch. 4. Increase block. 5. Field scale plantings. 6. Multiplication area. Each subsequent stage is fed from the preceding one.

8. *Special problems in cotton.*—Flowers formed up to the middle of August during the year under report in early sown cottons, showed as a rule complete non-dehiscence of anthers; in some cases partial dehiscence was noticed but all such flowers failed to set. After this, conditions for setting improved. A break however occurred for about a week when recurrence of non-dehiscence was noticed and the climatological record showed that air temperature during these days rose from 98° to 106° and humidity fell from 65-85 to 32-40. Some cottons such as Acala showed better condition of setting than others. The intensive and effective flowering period both in April sown and May sown cottons was nearly the same. These results have considerable bearing on the optimum date of sowing for cotton. The investigation is being continued. Seed development in cotton is subject to great seasonal variation. In the season 1926-27 the weight of seed was less than 50 per cent. of the normal seed weight. Causes of such sudden failures are under investigation.

Research on Wheat.

9. *Field trials, adaptation and acclimatization.*—Selected strains of Sind wheats and Punjab No. 11 were tested under irrigation with Pusa 12. Each type was grown in six alternate strips of about a guntha, with

Pusa 12. The average outturn per acre and difference in plot yield were as follows :—

Selected Strain under tests.	Calculated outturn in lbs. per acre.		Difference in plot yield (lbs.)	Remarks.
	Strain	Pusa 12		
G.S. 25 ..	2,562	1,295	$22 \cdot 36 \pm 0 \cdot 92$	All replications agreed.
C.Ph. 47 ..	2,721	1,588	$19 \cdot 98 \pm 1 \cdot 10$	Do.
A.T. 38 ..	2,181	1,249	$16 \cdot 44 \pm 2 \cdot 38$	Do.
Punjab 11 ..	2,206	1,425	$13 \cdot 77 \pm 1 \cdot 78$	Do.

G.S. 25 is a strain of awned wheat of Sind ; it has a weak straw. It has been found to be particularly suited to East Sind where trouble from birds is great. C.Ph. 47 is a beardless Sind wheat which has very strong straw and grain with high nitrogen per cent. It is admirably suited to cultivation under canal irrigation. A.T. 38 is another beardless wheat found to be suitable under "Bosi" conditions. Punjab 11 and Pusa 12 have been acclimatized ; the former is suited to East Sind and the latter to cultivation on wells in North Sind where the water supply is limited.

10. *Irrigation requirement of wheat crop.*—A total delta of 19 inches was applied in a period of 125 days giving a duty of 158 at the field ; the resultant crop was excellent.

11. *Further selection in Sind wheats.*—The district material still presents ample scope for improvement. A number of new selections are being tested.

12. *Hybridisation.*—Crosses have been made between C.Ph. 47 and A.T. 38 to combine high tillering of A.T. 38 with large number of grains in earhead of C.Ph. 47 to increase yielding capacity and also between Pusa 12 and Sind wheats to combine the yielding capacity of the latter with the grain quality of the former.

13. *Maintenance of purity of selected strains.*—A similar programme of work on the line of cotton maintenance was carried out. A number of hereditary characters were under study in pure lines.

14. *Classification.*—Three species, *viz.*, T. Vulgare, T. Durum, T. Compactum are found in Sind. There are about 30 varieties of Sind wheats which have been classified according to Kœrnicke's scheme.

15. *Bosi wheat scheme.*—There is a large tract of land in Sind where wheat is grown on moisture stored into the ground 2-3 months before sowing and without any subsequent watering or any rainfall. Experience has shown that A.T. 38 does well on Bosi land and is a considerable improvement over the common seed. A number of selections have been made in Bosi fields to raise strains superior to A.T. 38. There are other problems of Bosi cultivation awaiting solution. The work is being conducted at Jacobabad.

Research on Jowar

20. *Varietal trials.*—We have about 55 varieties of *Jowar* in Sind. These have been grown for the last few years at Larkana and from 1926

at Sakrand with the object of elimination of the worst varieties and concentration of the best in localities most suited to them. Six best among them are :—1. *Saoro Kartuho* ; 2. *Achho Kartuho* ; 3. *Bagdar* ; 4. *Allakh* ; 5. *Red Janapur* ; 6. *Acho Bazigar*. The first three are characterized by high yielding capacity and No. 4 has a good quality grain and No. 5 is specially hardy and can withstand drought and storms and No. 6 is extra early. These are now being tested in the current season on large field scale. We have about 2-3 selected pure strains raised from single plants in each of these varieties. Saoro Kartuho Strain No. 1 promises to be the future *Jowar* under Barrage conditions.

21. *Impurity of local seed.*—A number of samples were obtained from the district. None of the samples was pure, all contained seeds of several other varieties of *Jowar*, the mixture percentage ranging from 9 to 52.

22. *Extent of natural cross fertilization.*—Two varieties of *Jowar* differing only in the character of the leaf midrib and grown side by side showed 1·3 per cent. natural crossing.

23. *Study of hereditary characters.*—A number of constant characters were studied in all the pure strains in hand.

24. *Incidence of disease.*—*Jowar* has been fairly free from insect pests and other diseases. It has not been affected by white ants. There has been practically no trouble from stem borer ; no dead hearts have been noticed in young stage. Some borer attack was visible in the latter stage but it did not affect growth. Long smut is commonly noticed and is found to vary with the variety. Counts taken on 18 varieties in 1926-27 showed 9-200 smutted grains per earhead in an year of bad attack. Considering large number of grains formed in an earhead the percentage of damage is small. During the season under report the attack was less than 1 per cent. The *Jowar* earhead invariably contains a number of sterile grains. The causes of this sterility are not yet known and are under investigation. The sterility percentage ranged from 4·5 to 20 in four varieties.

25. *Improvement by selection.*—District material forms the basis of further selection in *Jowar*. A number of single plant cultures are being tested.

26. *Improvement by hybridisation.*—Crosses have been made with the object of improving yielding capacity of some prominent *Jowar* varieties by increasing the number of grains per earhead and also weight of grain. F1 generation will be grown during current season.

27. *Classification.*—A scheme of classification of Sind *Jowars* is in hand.

Research on Rice.

Rice research is being conducted at Larkana, since 1922. Full report of the work will be found in a recent issue of the Memoirs of the Department of Agriculture in India entitled " Studies on Sind Rice, Part I."

The selected strains have been established and have been distributed on large scale in the district. They have yielded 14-32 per cent. more yield than ordinary seed. Further improvement consists of further selection in the district and hybridisation of Kangni strain 27 with a high tillering variety called Torh and also with Kolumba 184 containing large number of grains per earhead. F1 generation has been grown in the current year.

The programme of work for the season 1928-29.

The programme for the season 1928-29 will be as follows :—

1. Maintenance of selected strains already in hand.

2. Testing of varieties both indigenous and exotic.

3. Breeding of new strains suited to Barrage conditions in each of the varieties found promising by selection, acclimatisation and hybridisation with particular reference to hardiness to withstand Sind conditions such as presence of salt in the soil, climate, diseases and pests like white ants.

4. Adaptation of varieties and strains, to different localities.

5. Study of hereditary characters and their mode of inheritance in crosses.

6. Botanical survey of varieties and types of each of the four staple crops as exist in the province, their classification and description.

7. Extent of natural crossing occurring in Sind and the composition of local seeds as regards mixture.

8. Study of special problems such as sterility in grain crops, non-dehiscence of anthers and shedding in cotton, and seasonal variation as affecting the seed development, etc., as they arise.

9. The study of agronomic factors connected with strains and varieties developed for the Barrage conditions such as effective sowing season, distance of planting, incidence of disease and water requirement.

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Annual Report of the Agricultural Research Station, Sakrand, for 1927-28.

Agricultural Section.

1. *Climate.*—Inundation water was available by the middle of July, consequently cultivation of cereals was delayed. The tube well which was fitted with a four-inch centrifugal pump at the commencement of the season gave just enough water to sow the vital experimental crops in good time. The rainfall which occurred in the end of July, amounted to five inches only, and proved to be exceedingly beneficial to the growing crops. Frost was experienced early in February when minimum shade temperature recorded was 27°. Rabi wheat escaped injury but *Tur* was completely killed and potatoes and sweet potatoes were adversely affected. The maximum temperature was 119° on 3rd June 1927.

2. *Kharif crops.*—To test Baker Lane duties on the field scale 24 acres were laid out for kharif crops, of which cotton (27 W.N.) occupied three acres. The seed was sown in lines partly in flat beds on good land and partly on the ridges on alkaline land. The flat beds received seven waterings and the ridge area eleven, up to 3rd of November, exclusive of rain and initial soaking. The total quantity of water received by the crop including the rain amounted approximately to 34 acre-inches. The yield amounted to 1,619 lbs. per acre from ridge sown area and 1,392 lbs. per acre from flat beds.

Jowar occupied four acres and was sown very late between 4th and 14th August on account of insufficiency of water during early part of the season. The crop yielded good quantity of fodder but only 333 lbs. per acre of grain. It received five waterings in addition to initial soaking and rain. The total water requirement therefore amounted approximately to 28 inches.

Bajri occupied three acres and suffered the same fate as *jowar* on account of late sowing. It received three irrigations only. The total quantity of water received by the crop amounted approximately to 20 inches.

Of the new crops likely to prove good introductions in the Barrage zone, castor is one which has proved to be hardy enough to resist *kalar*. Cowpea proved susceptible to *kalar* and *Tur* was damaged by the frost. Groundnuts seem to have a good future, although rats caused a considerable damage to the crop grown during the year under report. Suitable control measures which have proved successful elsewhere will be adopted to destroy this pest.

Maize and *Gowar* yielded good fodder but the latter being a leguminous crop is important as it has a rennovating effect on the soil fertility.

Til (Sesamum) suffered from cloudy weather and yielded 328 lbs. only.

Tobacco was transplanted on 12th August and received eleven waterings, the last being given on the 3rd November. The yield ranged between 937 to 1,272 lbs. per acre.

A few varieties of paddy were tried during the year but the experiment was abandoned on account of insufficiency of water.

3. *Rabi crops.*—Wheat has to occupy an important position in the Barrage scheme, consequently a number of pure strains isolated by the Department, were tried during the year for comparison purposes. All the varieties progressed satisfactorily. The crop received four waterings of about three inch each in addition to six to eight inches of initial soaking. The results are not available, as the threshing operations have not yet been finished.

Rape and *Jambo* were sown on two acres in the latter half of November and received two irrigations during the growing season. The yields of 1,190 lbs. and 1,150 lbs. have been obtained for rape and *jambo* respectively.

Gram and Matar.—Both these leguminous crops were tried on four acres, as *dubari* (second crop) as well as single crop. Severe winds of March and April affected setting; consequently the yield was affected. Gram yielded 158 lbs. per acre from *dubari* against 552 lbs. per acre from irrigated area and *Matar* 235 lbs. from *dubari* against 780 lbs. from irrigated area.

Among the new *Rabi* crops, Berseem (Egyptian clover) is destined to occupy a very important position in the perennial irrigation system. It provides excellent green feed to cattle during the cold weather, grows well in *kalar*, consequently helps in reclaiming *kalar* lands and maintains soil fertility to stand continuous cropping adopted in perennial irrigation system. The seed was sown on 17th to 19th November on three acres of bad *kalar* land. In all three cuttings were obtained from the crop. Its water requirements will approximate one cusec for 100 acres, consequently *Rabi* cropping intensity will have to be modified in order to introduce this crop.

Other crops on the programme were potatoes, onion, safflower, linseed and soybean which were either ploughed off or not grown except potatoes which were damaged by the frost.

4. *Other crops.*—Lucerne was sown on four acres in the last week of December 1926 and the 1st week of January 1927. The *kalar* area was ridged and the seed was dibbled in the furrows along both sides. The crop grew satisfactorily and yielded on the average 40,000 lbs. of green fodder per acre per annum. This crop has withstood appreciable alkalinity in the land which, when the crop will be out after three years, will have been improved for growing dry crops. The method of sowing *kalar* charged land in furrows, wherein *kalar* concentration decreases by watering, is a marked improvement.

Six varieties of Coimbatore sugarcane were obtained from Shahjahanpur and tried on the Farm, of which C.O. 213 proved successful. Further trials are necessary to study the economics of this variety.

5. *Haris' cultivation.*—About 50 acres from the undeveloped land were cultivated on tenant system, but the results were not satisfactory on account of insufficiency of water.

6. *Development works.*—During the year under report 64 acres of land were cleared of forest growth and about 100 acres levelled and canalised. A turbine pump was fitted in the tube well and about 2,500 feet of pacca channel were built. A block of kacha houses were built for the accommodation of the minor staff, the congestion has somewhat decreased but yet more houses are required to accommodate all the staff with some degree of comfort.

7. *Implements and Machinery.*—The development in this line has yet to take place in order to try and devise suitable assortment of implements and labour saving appliances which will be required to meet the extensive cropping scheme of the Barrage project and to avoid overlap of operations which will otherwise be a serious hindrance in the adoption of the Baker Lane Scheme.

8. *Live stock.*—During the year under report six pairs were purchased to increase the strength to ten pairs. One bullock of the old stock died during the year.

9. *Programme for 1928-29.*—An extensive programme has been laid out for the year 1928-29. It has been decided to give thorough test to "Baker Lane system" (2nd decade) both on good and bad land and at the same time to experiment with four alternative systems which are designed to overcome the varying alkalinity of the soil and also to maintain soil fertility and insure the revenue. These four alternative systems have been termed as "Sakrand A, B, C and D." The principle underlying system A is concentration of cropping so as to enable Berseem to be grown every year on the same land. Thus the man who has an estate of 370 acres of alkaline land and is entitled to a cusec of water, will select 100 acres on which he will conduct intensive cultivation, in order to make crop production possible, under such condition. In system B the same principle is involved but to a less degree, while in system C the same procedure is involved but still to a less degree. System D presumes that the land is tolerably good and free from alkali; and it is designed with the object of producing the same revenue as the Baker Lane Scheme, while conserving fertility of the land. A total area of 104 acres has been set apart for trials with the above systems. Full provision of drainage has been made to wash off the salts wherever necessary.

In addition to this the Agricultural Section has put in an area of five acres under manurial experiments. For this purpose before any further programme is made out the land will, during this year, be cropped under heavy feeders like *Jowar* in *Kharif* and Wheat in *Rabi* to exhaust the soil.

An area of about five acres is further set apart for growing special crops like Groundnut, Sugarcane, Castor, *Sann* Hemp, *Tur*, Lucerne, Safflower, Linseed, Onion, Potato, etc., etc.

The cultivation of rice is in the opening year being taken advantage of for washing off the salts in alkaline land. A block of fourteen acres has also been reserved for crop test in *Rabi*.

M. U. BARAKZAI,
Agriculturist,
Agricultural Research Station, Sakrand.

APPENDIX V

THE DEPARTMENT HAS PUBLISHED DURING THE YEAR UNDER REPORT THE FOLLOWING MEMOIRS, BULLETINS AND LEAFLETS.

Memoirs

1. Studies in the wilt disease of cotton in the Bombay-Karnatak, by Messrs. G. S. Kulkarni and B. B. Mundkur.

2. Studies in the shedding of mango flowers and fruits, Part I, by Mr. P. V. Wagle.

3. Further studies of Indian grasses and grasslands, by Dr. Burns, Mr. L. B. Kulkarni and Mr. S. R. Godbole.

Bulletins

1. Bulletin No. 136 of 1927—Cattle Breeding in the Bombay Presidency: Principles and Progress, by Mr. E. J. Bruen.

2. Bulletin No. 137 of 1927—Notes on the Lemon Industry in Italy, by Dr. G. S. Cheema.

3. Bulletin No. 138 of 1927—Injurious fiel drats of lower Sind and their extermination, by Mr. P. V. Wagle and Khan Bahadur Gul Mahomed A. R.

4. Bulletin No. 139 of 1927—Sugarcane mills and small power crushers in the Bombay Presidency, by Rao Bahadur P. C. Patil.

5. Bulletin No. 140 of 1927—Tobacco cultivation in the Southern Maratha Country, by Mr. S. S. Salimath.

6. Bulletin No. 141 of 1927—Trees and shrubs for producing green manure in the Konkan and North Kanara, by Messrs V. G. Gokhale and V. S. Habbu.

7. Bulletin No. 142 of 1927—Dry farming methods in the Deccan, by Messrs. V. A. Tamhane, N. V. Kanitkar and G. M. Bapat.

8. Bulletin No. 143 of 1927—Experiments on cotton manuring in Khandesh, by Messrs. K. M. Pawar and N. G. Apte.

9. Bulletin No. 144 of 1927—Furnaces for making gul or crude sugar in the Bombay Presidency, by Rao Bahadur P. C. Patil.

10. Bulletin No. 145 of 1927—The origin, plan and progress of the Sakrand Agricultural Research Station, Sind, by Dr. H. H. Mann.

11. Bulletin No. 146 of 1927—The crops of the Bombay Presidency: Their Geography and Statistics, Part II, by Mr. G. R. Ambekar.

12. Bulletin No. 147 of 1927—The organization and cost of gul making in the Deccan Sugarcane tracts, by Rao Bahadur P. C. Patil.

13. Bulletin No. 148 of 1927—Culture of guava and its improvement by selection in Western India, by Dr. G. S. Cheema and Mr. G. B. Deshmukh.

14. Bulletin No. 149 of 1927—Studies in the cost of production of crops in the Deccan, by Rao Bahadur P. C. Patil, Mr. T. G. Shirname and Mr. T. B. Pawar.

15. Bulletin No. 150 of 1927—The crops of Sind: Their Geography and Statistics, by Mr. G. R. Ambekar.

Leaflets (with Vernacular versions).

1. Leaflet No. 7 of 1927—Iron mhots for raising water.

2. Leaflet No. 8 of 1927—Agricultural Machinery and Agricultural Engineering.

3. Leaflet No. 9 of 1927—Manures for the tobacco crop in Gujarat.

4. Leaflet No. 10 of 1927—Tobacco as a crop in the Dharwar District.

5. Leaflet No. 11 of 1927—Importance of pure-bred bulls for breeding.

6. Leaflet No. 12 of 1927—Pig-killing to decrease damage to crops.

7. Leaflet No. 13 of 1927—Maize and tur in the Gokak Canal Area.

8. Leaflet No. 14 of 1927—The north-west Locust.

9. Leaflet No. 15 of 1927—Cotton as a rotation crop in the Gokak Canal Area.

10. Leaflet No. 16 of 1927—Maize silage in the Gokak Canal Area.

11. Leaflet No. 17 of 1927—Poudrette as a valuable manure on sugarcane.

12. Leaflet No. 18 of 1927—Method of obtaining good jowar seed in the East Deccan.

13. Leaflet No. 19 of 1927—Sulphate of Ammonia as a field manure for the rice crop.

14. Leaflet No. 20 of 1927—Drainage in orange and mosambi plantations on the Deccan Canals.

15 Leaflet No. 21 of 1927—Cultivation of Spanish Peanut groundnuts in Khandesh.

16. Leaflet No. 22 of 1927—More economic water lifts for the Konkan.

17. Leaflet No. 23 of 1927—Economic method of controlling the pomegranate caterpillar.

18. Leaflet No. 24 of 1927—The budding of wild bor trees in Gujarat.

19. Leaflet No. 25 of 1927—Dry farming in the Deccan.

20. Leaflet No. 26 of 1927—Improvement of lemon crop by budding.

21. Leaflet No. 27 of 1927—Some useful types of paddy for the Kanara District.

22. Leaflet No. 1 of 1928—Control of the anthracnose of grape.

23. Leaflet No. 2 of 1928—The value of poudrette as a manure for cotton in South Gujarat.

24. Leaflet No. 3 of 1928—Use of poudrette as manure to jowar (Dharwar).

List of Agricultural Bulletins published by the Department of Agriculture and kept for Sale at the Government Book Depot, Bombay.

No.	Year.	*Subject.*	Price. Rs.	a.	p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa ..	0	8	0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D. ..	0	4	0
,,	,,	,, ,, ,, (Kanarese)	0	4	0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona ..	0	4	0
35	1909	Kalar in Sind, by G. S. Henderson, Deputy Director of Agriculture, Sind ..	0	4	0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist ..	0	14	0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta ..	0	4	0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona ..	0	5	0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon ..	0	12	0
41	1911	Groundnuts in the Bombay Deccan ..	0	4	0
43	1911	An Examination of the Seed-Supply of the Broach District, Part II ..	0	5	0
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency ..	0	8	0
45	1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency ..	0	14	0
46	1911	Seed Selection Series I, Broach Cotton ..	0	8	0
47	1911	San Hemp ..	0	4	0
48	1911	Poona Furnace ..	0	7	0
,,	,,	,, ,, (Marathi) ..	0	6	0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I ..	0	5	0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0	3	0
51	1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew ..	0	3	0
52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India ..	0	8	0
53	1912	A Method of improving the Quality of Cotton Seed ..	0	7	0
55	1913	An Examination of the Seed-Supply of the Poona District	0	3	0
57	1913	Improvement of the Indigenous Plough of Western India	0	12	0
59	1914	Common Salt and its use as Manure in the Konkan Division ..	0	3	0
62	1914	The Value of Castration of Deccan Bullocks ..	0	3	0
63	1914	Substitutes for Rab ..	0	3	0
64	1914	Alkali or Kalar Experiments and Completion Report of Daulatpur Reclamation Station in Sind ..	0	14	0
65	1914	A list of diseases of Economic Plants occurring in the Bombay Presidency ..	0	4	0
67	1914	An Examination of the Seed-Supply of the Sholapur District ..	0	3	0
69	1915	The Rice Stem Borer in the Konkan ..	0	3	6
70	1915	Improvement of Cotton in the Bombay Presidency (except Sind) ..	0	3	6
74	1915	Well Waters from the Trap Area of Western India ..	0	6	0
78	1916	Some Wild Fodder Plants of the Bombay Presidency ..	0	13	0
79	1916	The Cultivation of Guavas in Gujarat ..	0	5	6

No.	Year.	*Subject.*	Price. Rs.	a.	p.
80	1916	List of Seeds available on the Agricultural College Farm, Poona	0	5	3
81	1916	Note on Fencing Construction ..	0	6	9
82	1916	Cultivation of Drilled Paddy in South Bombay Presidency	0	8	0
83	1917	The Spice Gardens of Sirsi in Kanara ..	0	10	6
84	1917	Seed Selections Series—Kumpta Cotton ..	0	1	0
85	1917	Note on Cattle in the Bombay Presidency ..	0	11	0
86	1917	Establishment and Management of the Dairy Farm ..	0	7	0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm ..	0	9	0
88	1918	First Reports on Fruit Culture as practised round about Tharushah (Sind) in Nawabshah District ..	0	2	0
89	1918	Artificial Manures: Experiments on their value for crops in Western India ..	0	3	3
90	1918	Work on the Manjri Farm for the years 1915-18 ..	0	7	3
91	1919	The Cultivation of Berseem in Sind: Experiments at Sukkur ..	0	1	0
92	1919	Classification and Description of the Jowars of the Bombay-Karnatak	0	10	3
93	1919	Palm Gul Manufacture in the Bombay Presidency (Principally Date Palm) ..	1	3	9
94	1919	The Sugarcane Borer and its Control ..	0	4	3
95	1919	The Cultivation of Oranges and Allied Fruits in the Bombay Presidency ..	0	2	6
96	1920	Investigations into the nature of the Salt Lands of Sind ..	0	12	0
97	1920	Prickly-Pear as a Cattle Food ..	1	4	0
98	1920	Fruit Culture as practised near Shikarpur, Sind ..	0	1	6
99	1920	Rice Cultivation in the Larkana District, Sind ..	0	8	0
100	1920	Fodder Crops of Western India ..	2	1	0
101	1920	Fruit Culture in Palitana and Jamnagar ..	0	8	6
102	1920	Investigations on Potato Cultivation in Western India ..	1	15	0
103	1920	The Book of the Mango ..	3	5	0
		" " " (Marathi).			
104	1920	The Ganeshkhind Botanical Garden, Kirkee (Its Genesis and Development) ..	0	15	6
105	1920	The Groundnut Bug and its Control ..	0	2	0
106	1920	Dharwar American Cotton: Its History, Cultivation and Improvement ..	0	7	0
107	1921	Gonag—a weed in drilled paddy ..	0	5	0
108	1921	Summary of the Work done on Jalgaon Farm ..	0	5	6
		" " " (Marathi).			
109	1921	The Crops of the Bombay Presidency: Their Geography and Statistics ..	2	13	0
110	1922	Year Book of the Agricultural Department in the Southern Division ..	0	5	0
111	1923	A Note on Well Boring ..	0	8	0
112	1923	Improvement of Grazing Areas in the Bombay Presidency	0	11	6
113	1923	Year Book of the Agricultural Department in Sind Division	0	8	6
114	1923	Studies on the Rice Plant and on Rice Cultivation ..	0	13	0
115	1924	Shevri as a Fodder Crop ..	0	3	0
116	1924	Sugar Industry in Western India and Methods of Sugar Manufacture ..	1	2	0
117	1924	Investigations in Fig Culture and Treatment ..	0	5	6
118	1924	Land Crabs as Agricultural Pests in Western India ..	0	8	0
119	1924	Year Book of the Agricultural Department in Southern Division, 1924 ..	0	4	6
120	1924	Silage for Fodder in Western India ..	0	4	0
121	1924	Further Investigation on Potato ..	0	6	0
72	(Revised 1925)	Experiments with the Automatic Water Finder in the Trap Region of Western India	0	4	0
122	1925	Sugarcane Varieties of Bombay Presidency, India ..	0	2	6
123	1925	Ridge Cultivation in Lower Gujarat ..	0	8	0
124	1925	The Chemical Composition of Food-grain Vegetables and Fruits of Western India ..	0	3	6

No.	Year.	*Subject.*	Price. Rs. a. p.
125	1925	Some of the promising exotic sugarcane varieties of the Manjri Farm ..	0 13 0
126	1925	The Bhagnari Breed of Cattle in Sind and Baluchistan ..	0 6 0
127	1926	Elephant Grass—a new and useful Fodder Crop in Western India ..	0 1 0
128	1926	Cotton Cultivation in Sind ..	0 3 0
129	1926	The treatment of patches of Inferior Tobacco in Northern Gujarat ..	0 1 6
130	1926	Some useful Forest Trees and Shrubs of the Coastal Tract and their fodder value ..	0 8 0
131	1926	The Fig Industry of Asia Minor ..	0 4 6
132	1926	The Improvement of Tobacco in Northern Gujarat ..	0 4 0
133	1926	Work of the Ganeshkhind Botanical Garden and Modibag Garden in 1921-1925 ..	0 2 0
134	1927	Murrah Buffaloes in Sind ..	0 2 6
135	1927	An improved method of growing turmeric in the Deccan ..	0 4 0
136	1927	Cattle Breeding in the Bombay Presidency: Principles and Progress ..	0 5 6
137	1927	Notes on the Lemon Industry in Italy ..	0 2 0
138	1927	Injurious Field Rats of Lower Sind and their extermination	0 7 6
139	1927	Sugarcane Mills and Small Power Crushers in the Bombay Presidency ..	0 6 6
140	1927	Tobacco Cultivation in the Southern Maratha Country ..	0 3 0
141	1927	Trees and Shrubs for producing Green Manure in the Konkan and North Kanara ..	0 3 0
142	1927	Dry Farming Methods in the Deccan ..	0 6 9
143	1927	Experiments on Cotton Manuring in Khandesh ..	0 1 3
144	1927	Furnaces for making Gul or Crude Sugar in the Bombay Presidency ..	0 7 3
95 (Revised	1927)	The Cultivation of Oranges and Allied Fruits in the Bombay Presidency.	
145	1927	Origin, Plan and Progress of the Sakrand Agricultural Research Station, Sind ..	0 4 3
146	1927	Crops of the Bombay Presidency: Their Geography and Statistics Part II ..	1 11 0
147	1927	Organisation and Cost of Gul Making in the Deccan Sugarcane tracts ..	0 2 6
148	1927	Culture of Guava and its improvement by selection in Western India ..	0 7 3
149	1927	Studies in the cost of production of crops in the Deccan: No. 1 Crops in the neighbourhood of Poona ..	1 1 6
150	1927	Crops of Sind: Their Geography and Statistics ..	2 1 0
151	1928	Selections in the Jowars of the Bombay Presidency ..	0 6 0
152	1928	Water-finder Work in the Bombay Presidency ..	0 8 0
153	1928	Economic Value of Fruit Farming in Western India ..	0 6 0
154	1928	Assimilation of Nutrients by the Rice Plant ..	0 5 0

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